DOCUMENT RESUME

ED 300 253 SE 050 089

AUTHOR Hallowell, Anne; And Others
TITLE Recycling Study Guide.
INSTITUTION Wisconsin State Dept. of Natural Resources, Madison.
REPORT NO PUBL-IE-020-87
PUB DATE Jan 88
NOTE 34p.; Colored drawings may not reproduce well.
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Conservation (Environment); Elementary School Science; Elementary Secondary Education; *Environmental Education; Junior High Schools; *Laboratory Procedures; Middle Schools; *Recycling; *Science Activities; Science Education; Secondary School Science; *Solid Wastes; Teaching Methods; *Waste Disposal
IDENTIFIERS *Composting

ABSTRACT

This study guide was designed to help teachers and students understand the problems surrounding solid wastes. It includes an overview of solid waste and recycling, a glossary, suggested activities and a list of resource publications, audiovisual materials and organizations. There are 19 activity suggestions included in this guide designed for use in grades 4 through 12. Topics include solid waste production, natural resources, landfills, composting, packaging, and decision making. Each activity includes goals, grade levels, materials, procedures, and discussion questions. In addition, 32 activity ideas are suggested. References are divided into general, composting and decomposition, curriculum materials, audiovisual materials, agencies, and organizations. Interdisciplinary cooperation is stressed throughout. (CW)

Recycling Study Guide

Table of Contents

Introduction 1
Glossary 5
Activities:
Out of Sight, Out of Mind
Part 1 — My Ton of Trash 6
Part 2 — Class Trash 7
Part 3 — Trash or Treasure? 8
Part 4 — Cutting Class Trash 9
Right in My Hometown
Part 1 — Natural Resources: Handle With Care 10
Part 2 — Biography of a Product 11
Where Has All The Garbage Gone?
Part 1 — Making a Mini-Landfill 12
Part 2 — Follow That Garbage! 13
Composting: A Great, Rotten Idea
Part 1 — Is It Rotten? 14
Part 2 — Readin', Rottin' and 'Rithmetic: Classroom Composting .. 15
Is It A Waste?
Part 1 — All Wrapped Up 17
Part 2 — What's the Appeal? 17
Part 3 — How Many Ways Can You Wrap an Apple? 18
Part 4 — Packaging: Is It A Waste? .. 19
Part 5 — What Can I Do To Change Packaging? 20
How Times Have Changed
Part 1 — What, No Video Games? ... 22
Part 2 — The Garbage Guzzler Strikes Again 23
The Cost of the Toss
Part 1 — Decisions, Decisions 24
Part 2 — Paying the True Price of Pop 26
Time For Action 27
More Activity Ideas! 28
Resources 30

WISCONSIN DEPT. OF NATURAL RESOURCES

PUBL-IE-020 87
January 1988

Introduction

To Educators

Is it your turn to take out the trash? Pile your trash with all the food scraps, paper, old chairs, pop bottles and other solid waste thrown away in Wisconsin every year, and you get 6.5 million tons of stuff. Why are we making all this trash, and where does it end up?

This study guide is intended to help you and your students understand what solid waste is, where it comes from, why it's a problem and what can be done about it. The guide includes an overview of solid waste and recycling, a glossary, suggested activities and a list of resource publications, audio-visual materials and organizations. It is designed to stand alone, yet complements the Wisconsin Department of Natural Resources (DNR) free publication, **Special Recycling Edition** (see Resources).

You are encouraged to use the information and activities in this guide and the **Special Recycling Edition** with your students in all disciplines. The Department of Public Instruction's **Guide to Curriculum Planning in Environmental Education** has suggestions for infusing subjects like solid waste and recycling into your social studies, art, English/language arts, health, mathematics, science, environmental education and other classes. You also may want to consult other resources listed in this guide and check newspapers and magazines for current articles that address solid waste and recycling issues. Many excellent curriculum materials exist and we hope that you will send for and use them.

Consider talking with your students about solid waste and recycling before beginning your lessons to learn what they already know and think about it. Why is trash collected? Where is their trash taken? Have they ever visited a landfill? What did people do before there were plastic bags or aluminum cans or trash removal services? Do people in other countries make as much trash as Americans do? By finding out your students' thoughts and opinions, you can help them connect new concepts with what they already know.

The activities in this guide are designed for use in grades 4-12. With modifications, they should be useful in other grade levels. We encourage you to tailor the activities to meet your students' needs. You are welcome to revise and/or reproduce any part of this guide for distribution to students and other educators.

NOTE:

- *Words that appear in italics are defined in the glossary.*
- *Sections marked with * are based on materials from the A-Way With Waste curriculum guide, a program of the Washington State Department of Ecology (see Resources).*

Sizing Up Solid Waste

Every day we throw out everything from toothpaste tubes to old TV sets, grass clippings to plastic milk jugs, jelly jars to paper. You may not personally stuff 7.5 pounds of *solid waste* into the *trash* bag every day, but if you add up all the waste from your house, classroom and school cafeteria, from the restaurant where you ate, from the factories that made your clothes or paper, from the utility that generated your electricity and from the stores where you shopped, it amounts to about 7.5 pounds a day per person. Multiply that by 365 days per year, then by 4.8 million Wisconsin citizens, and your results show that Wisconsin throws away more than 6.5 million tons of stuff each year!

But where is "away?" Is there such a place?

Six and one half million tons of waste is enough to pile a typical city street six-feet deep, curb to curb, for 500 miles — more than the distance from Superior to Chicago! Or if compressed, the way it is in *landfills,* that much waste would bury a 200-acre farm under 30 feet of trash each year. So...

Wisconsin's Annual Trash Tally

Total Waste	6.5 million tons
Municipal Waste	3.5 million tons
Paper	1.4 million tons. Equal to a forest of 20-25 million trees a year. Largest portion of solid waste.
Food & yard waste	600,000 tons. 15-20% of the total.
Glass bottles	200,000 tons. 750 million bottles, half for soda and beer. On the decline, as more beverages are packaged in plastic and foil bottles, pouches, and boxes.
Metal cans	91,000 tons (30,000 tons aluminum, 57,000 tons steel, 4,000 tons bimetal). 2.5 billion a year, including enough aluminum soda and beer cans (1.4 billion) to circle the earth 4 times.
Tires	60,000 tons. 4 million a year. An estimated 15-20 million tires are stockpiled in Wisconsin.
Motor oil	58,000 tons (50,000 tons or 12.5 million gallons from service stations; another 8,000 tons or 2 million gallons from people who change car oil at home). State law requires stores and communities to set up collection centers.
Plastic containers	25,000 tons. 400 million a year. Growing rapidly.
Other waste	1 million tons. Composed of wood, demolition debris, old furniture, clothing, other plastic, etc.
Non-municipal waste	3 million tons. Composed of pulp, ash, and foundry waste.

Where Does It All End Up?

Most of Wisconsin's solid waste ends up in the state's 1,100 licensed landfills. A landfill is a place where waste is dumped, compacted and covered with dirt. Covering the trash controls blowing paper, odors, insects and rodents.

Of the 1,100 licensed landfills in Wisconsin, only 90 are *sanitary landfills* — designed, built and operated according to state-of-the-art standards to prevent *pollution* problems. These engineered or "approved" landfills are constructed only after the Wisconsin DNR approves the site and the operating plan. The DNR checks the site for soil type, potential for contaminating *groundwater* and surface water, proximity to buildings and future land use. It reviews plans for landfill construction, operation, *leachate* and gas control, closure and long-term care. Approved landfills must be maintained by the owner for 20-30 years after the site is closed. When the owner's responsibility ends, the state takes over maintenance duties. The owner, however, remains liable for any damage that his landfill does to other people or property.

The remaining licensed landfills are unengineered or "nonapproved." They were built before we realized the importance of strict environmental standards. Most of these facilities are scheduled to be closed by 1999. A closed landfill, however, can continue to affect the environment many years after it's sealed up and forgotten. Owners of unapproved landfills must take care of them as long as they own the land and are liable for any resulting damage.

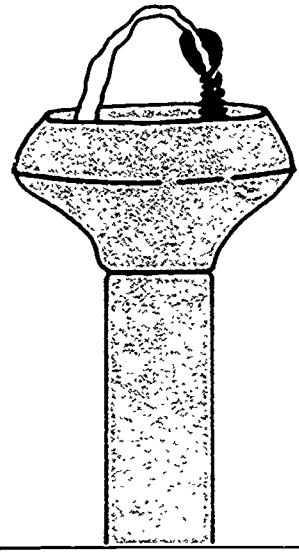
In addition to licensed, operating landfills, Wisconsin has more than 2,700 closed landfills. The same long-term liability and care described above for approved and nonapproved landfills apply to these closed landfills.

Unfortunately, waste sometimes is dumped along roadsides, on the "back forty" or in other nonapproved locations. Except for household wastes discarded on the homeowner's property, it's illegal to discard or incinerate *garbage,* trash, industrial waste, farm chemicals and other waste in places that aren't approved by the state. Discarding waste in unsafe ways and in nonapproved places can endanger the environment upon which we depend. Thus, each of us becomes responsible for what we throw away and the impacts this waste may have on our environment.

So What's The Problem?

Water Pollution

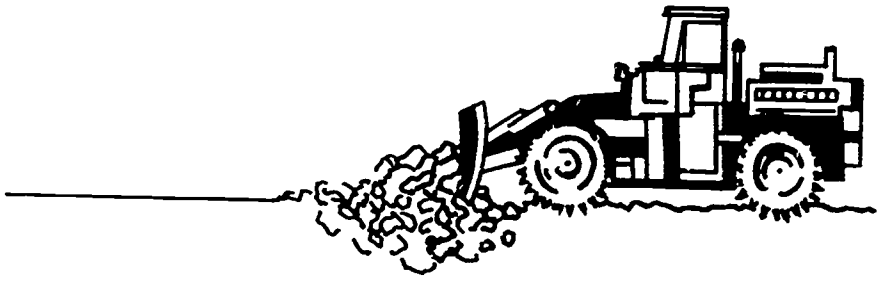
What happens when rainwater or melting snow seep through buried trash? A liquid called leachate forms that can flow out of the landfill. Leachate contains concentrated contaminants that can be harmful, especially if they seep into surface water and groundwater supplies. Groundwater quality is a major concern, since two out of every three people in Wisconsin drink groundwater. The *hazardous wastes* in leachate come from many sources, including items we commonly throw out at home, like motor oil, paint, garden pesticides and household cleaners.



Land Use

In 1985, 14,000 acres of Wisconsin land — the equivalent of 70 typical Wisconsin farms — were being used for landfills. Some people question whether this is a wise use of our land.

As we continue to make waste, the landfills are filling up, creating what has been called a "garbage crisis" in many states. The DNR estimates that most existing landfills in Wisconsin will be full within 10 years. In some areas, landfills will reach capacity even sooner. Thus, the need for developing new *recycling* systems and landfills in Wisconsin is increasing and urgent.

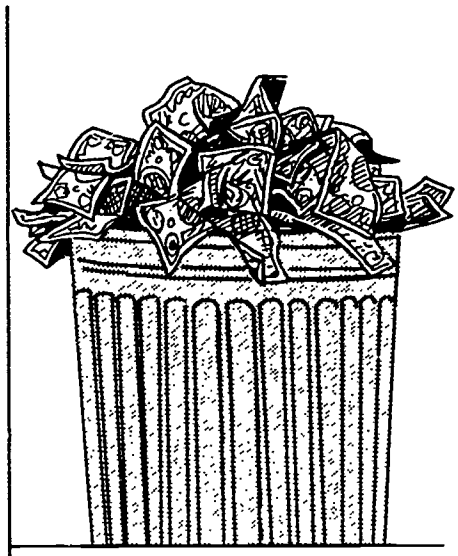


Hazardous Gases

Methane gas can form in landfills as a result of *decomposition* of *organic* materials like grass clippings and food wastes. Methane is flammable and toxic, and can move through the soil into the air or into nearby basements. Recently, researchers have discovered that when some plastics and other human-made chemicals decompose, they liberate small amounts of even more hazardous gases, like vinyl chloride and hydrogen sulfide.

Economics

Wisconsin citizens pay $50-$75 million a year to construct and manage sanitary landfills. Collecting and transporting garbage to the landfills adds an estimated $150-$200 million more. Costs have risen rapidly in the past 5-10 years, primarily due to the expense of handling and burying wastes in ways that protect the environment.



The NIMBY Phenomenon

Finding places to put landfills isn't easy. Few people are eager to live near a landfill, an attitude sometimes called the NIMBY phenomenon: "Not In My Back Yard!" Many people believe landfill construction and operation result in traffic, noise, dust, aesthetic loss, declining property values, groundwater contamination and other hazardous waste pollution. While fears often have been justified, modern landfill design, construction and management can minimize most of these problems.

Resources Recovered in Wisconsin (1984)

Materials	Estimated Tons/Year
Municipal wastewater plant sludge	8.2-8.5 million
Cheese whey	4.1 million
Ferrous metals	1.5 million
Pavement	1.5 million
Waste wood	1.5 million
Scrap paper	1.3 million
Sulfite liquor from paper mills	1.0 million
Coal ash	280,000
Rendered materials (animal remains)	250,000
Pulp/paper mill sludge	100,000
Hazardous wastes	70,000
Waste burned for energy	70,000
Glass	35,000
Aluminum cans	12,000
Leaves municipally composted	4,000
Plastics, barrels and drums, pallets, clothing, non-ferrous metals	?

What Else Can We Do With The Trash?

Wisconsin already *reuses,* recycles, *composts* or *recovers energy* from more than 20 million tons of waste each year. This reduces the need for landfill space, saves the cost of disposal and reuses valuable *natural resources.* Under state law (SS 144.792), Wisconsin has adopted policies to encourage waste reduction and recovery as alternatives to landfilling. The law requires that Wisconsin (in order of priority):

1. **Reduce** the quantity of waste produced. For example, packaging can be designed to use less material, to be recyclable and to contain fewer hazardous chemicals. We can encourage redesign of packaging by selective shopping and by expressing our views about packaging to retailers, industry and government.

2. **Reuse** items. Soda bottles, old furniture, clothes, tires, appliances and automobiles or their parts, industrial shipping containers (barrels, pallets, cardboard boxes) and many more items can be reused.

3. **Recycle**. Recycled newspaper can be made into newsprint, paper bags, cellulose insulation, egg cartons, animal bedding or cardboard. A state beverage container deposit law (sometimes called a *bottle bill*) could provide us with the incentive to return beverage containers for a deposit. Glass and aluminum from beverage containers can be made into new containers. Cooking oils and meat fats can be made into chemicals and cosmetics, coal ash into shingles and concrete and plastic bottles into artificial lumber and winter jackets. The DNR's goal is to recycle at least 10% of the waste now landfilled.

4. **Compost** organic wastes. Gardeners know both the ease and the value of composting food and yard wastes to create rich *humus* that improves soil fertility and texture. Some businesses also can compost their organic wastes. For example, cheese whey, organic sludges from paper mills and sewage treatment plants and remains from cleaning fish can be composted. The DNR's goal is to compost 10% of the municipal waste now landfilled.

5. **Recover** energy from waste. Each ton of solid waste has the energy equivalent of 70 gallons of gasoline — enough energy to drive a small car from coast to coast. Wisconsin's goal is to recover energy from 55% of the state's municipal waste.

6. **Landfill** nonrecoverable items. We may always need landfills, but Wisconsin is working to reduce this need. Using the techniques described above, Wisconsin aims to cut the need for landfills in half by 1990. The long-term goal is a 75% reduction.

None of these options is the sole solution to our waste disposal problem. Each option has side effects that must be considered when we're selecting the best solution to each solid waste problem.

What Can You Do?

You can start by looking at what you throw away at home. Each person's "drop in the bucket" adds to the trash problem. If each drop becomes smaller, the problem will be reduced.

Everyone produces some waste, but you don't have to be a "super-consumer." Think about the goods, services and activities you buy or support. In what ways do they contribute to the solid waste problem? How could you purchase and dispose of items in ways that generate less trash? What can you do to voice your opinion about solid waste issues in your community? For example, consider:

- buying goods in returnable and recyclable containers.
- learning where you can take items to be recycled and showing your support by recycling.
- composting food wastes, leaves and grass clippings.
- finding people in your town who are interested in reducing waste, promoting recycling, inventing new uses for old materials, fighting *litter* or encouraging local merchants to sell goods in returnable containers. How can they help you? How can you assist them?
- taking an active interest in how your *solid waste management* tax dollars are spent. Compare your community's hauling and disposal costs with those of neighboring towns. Investigate the quality of your local landfill and measures being taken to make it as safe and long-lasting as possible.
- learning how nature recycles materials. Is much wasted?

Wisconsin's solid waste management goal is to find the best political, economic, social and personal ways to reduce waste and keep our environment healthy. Our most creative solutions are those that imitate the natural systems that have successfully recycled waste products for millions of years.

Each of us contributes to the solid waste problem. Each of us can help solve it.

Glossary

biodegradable: the property of a substance that permits it to be broken down by microorganisms into simple, stable compounds such as carbon dioxide and water. (See "decompose.")

bottle bill: a law requiring deposits on beverage containers, like aluminum cans and plastic bottles. Encourages recycling and discourages littering and landfilling. More accurately called a beverage container deposit law.

composting: waste management process that creates an optimal environment for decomposition by layering organic wastes like food scraps and grass clippings so they'll decay into fertile humus.

conserve: to protect from loss or depletion. Conservation is the wise use of natural resources to minimize loss and waste.

decompose: to break down into component parts or basic elements; to rot. Decomposition is imperative for the continuation of life since it makes essential nutrients available for use by plants and animals.

dump: open, unsanitary disposal site used before existence of licensed, controlled burial sanitary landfills. Now illegal in Wisconsin.

energy recovery: the generation of energy by burning solid waste.

garbage: spoiled or waste food that is thrown away. Generally defined as wet food waste; excludes dry material (trash). The term is often used interchangeably with the word "trash."

groundwater: water beneath the earth's surface that fills the spaces and moves between soil particles and rock. Supplies wells and springs. Two out of every three Wisconsin citizens drink groundwater.

hazardous waste: waste that causes special problems for living organisms or the environment because it is poisonous, explosive, burns or dissolves flesh or metal, ignites easily with or without a flame or carries disease. Some hazardous wastes cause only one problem, others cause several.

humus: organic material consisting of decayed vegetable matter that provides nutrients for plants and increases the ability of the soil to retain water.

landfill: a site for the controlled burial of solid waste.

leachate: liquid that has percolated through solid waste and/or been generated by solid waste decompostion and contains extracted, dissolved or suspended materials. May contaminate groundwater or surface water.

litter: waste materials discarded in an inappropriate place. Littering is illegal in Wisconsin.

methane: a colorless, odorless, flammable, potentially dangerous gaseous hydrocarbon (CH_4) present in natural gas and formed by the decomposition of organic matter. Can be used as a fuel.

natural resource: valuable, naturally occurring material such as soil, wood, air, water or minerals.

nonrenewable resource: a natural resource that, because of its scarcity, the great length of time it takes to form or its rapid depletion, is considered finite in amount (e.g., coal, copper, petroleum).

organic: derived from living organisms.

pollution: harmful substances deposited in the environment, leading to a state of dirtiness, impurity or unhealthiness.

raw material: unprocessed natural resource or product used in manufacturing.

recover energy: see "energy recovery."

recycle: the collection and reprocessing of manufactured materials for reuse either in the same form or as part of a different product.

renewable resource: a natural resource derived from an endless or cyclical source (e.g., sun, wind, water, wood, fish). With proper management and wise use, replacement of these resources by natural or human-assisted systems can be approximately equal to their consumption.

reuse: to extend the life of an item by using it again, repairing it, modifying it or creating new uses for it.

sanitary landfill: a specially engineered site for disposing of solid waste on land. Constructed in a way that reduces hazards to health and safety.

solid waste: all solid and semi-solid wastes, including trash, garbage, yard waste, ashes, industrial waste, swill, demolition and construction waste and household discards such as appliances, furniture and equipment.

solid waste management: the controlling, handling and disposal of all solid waste. One goal of solid waste management is to reduce waste to a minimum.

trash: material considered worthless, unnecessary or offensive that is usually thrown away. Generally defined as dry waste material; excludes food waste (garbage) and ashes. The term is often used interchangeably with the word "garbage."

Activities

Out of Sight, Out of Mind

Part 1 — My Ton of Trash

Goal: To help students visualize how much waste is generated for each person in Wisconsin and understand how the number of people living in our state and country affects this amount.

Subjects: Mathematics, social studies, science, environmental education, health.

Grades: 6-12

Materials:
- 7.5 pound bag of miscellaneous trash (wash containers, avoid items with sharp edges)

Procedure:

1. Describe trash and list some examples. Discuss:
- What qualities does an item have that makes you decide it's trash?
- What different kinds of trash are there?

2. Dump the 7.5 pound bag of trash on the floor. Discuss:
- Does this seem like a lot of trash? This much trash is thrown out each day for every person in Wisconsin.
- How do you think the number "7.5 pounds" was calculated? Who figured out this number? Will the number ever change? Why?
- How do you feel about the fact that you're responsible for 7.5 pounds of trash that is thrown out each day?

3. Calculate:
- If you generate 7.5 pounds of trash each day, how many pounds do you make every week, month and year?
- Convert these numbers from pounds into tons. How many tons of trash do you make every week, month and year?
- To help you visualize how much a ton weighs, add the weights of students in the class until you reach one ton. How many students does it take to make a ton? How many "students-worth" of trash do you make every week, month and year?
- How many people are in your family? If 7.5 pounds of trash is generated each day for every person, how many pounds or tons of trash does your family make every week, month and year?
- How many people live in Wisconsin? How many pounds or tons of trash is generated each day in Wisconsin?

Discuss:
- What happens to all the trash you throw away?
- Where is "away?" Is there such a place?
- What do you think happens to waste at the landfill? (See activity: Where Has All the Garbage Gone?)
- What are possible problems with piling waste in landfills?
- What would you do with your family's trash if there was no truck that came to take it away? How might this affect the amount of trash your family makes?

4. Research the rate of human population growth in Wisconsin and the U.S. since 1650. Discuss:
- What relationship might there be between an increasing human population and the amount of solid waste generated?
- How might the amount of solid waste generated be influenced by changes in lifestyles since 1650? (See activity: How Times Have Changed.)
- How might the amount of solid waste generated be influenced by family income?
- How have increases in numbers of people and amounts of solid waste affected the environment?
- What are the predictions for future human population growth?
- What predictions might you make for the amounts of solid waste we'll produce in the future?
- What impacts might an increasing population have on our use of natural resources?

5. Calculate:
- If every person in Wisconsin threw away one less pound of trash per day, how much less trash would end up in our state's landfills?

Discuss:
- What could you do to reduce the amount of waste you make?

Pre- and Post-Activity Questions:
- How many pounds of trash do you think are thrown out each day for every person in Wisconsin?
- What relationship, if any, is there between the number of people and the amount of trash?

Part 2 — Class Trash

Goal: To have students calculate the amount and types of trash thrown out by their class at school and investigate where it's taken.

Subjects: Mathematics, social studies, science, environmental education, health.

Grades: 7-12

Materials:
- trash generated by your class on a typical day (save for use with Part 3)

Note to Teacher: Students will need to be familiar with the concepts of weight, volume and number in order to do the following activity and understand its implications. Consider using this activity as part of a mathematics lesson that addresses these concepts.

Procedure:

1. List the items you throw in the classroom and lunchroom wastebaskets on a typical day. Now categorize them according to what material they're made of (e.g., food, paper, plastic, aluminum, glass). Predict what four types of materials make up the greatest portion of the waste by: weight, volume, number of items. Record your predictions.

2. Collect and save the trash your class generates (in the classroom, artroom, shop, lunchroom, etc.) on a typical day (wash jars and cans, place food trash in a sealed container). You can save trash for more than one day, if you wish. This will enable you to calculate the average amount generated by your class each day.

3. Dump the trash on the floor. Sort items into piles according to the type of material of which the items are made.

4. Count the number of different items of each type (e.g., 47 pieces of paper, 3 aluminum soda cans, 8 juice boxes, 11 plastic bags, 1 broken pencil). What types of items comprise most of the trash by number? Draw a bar graph to illustrate this. Place the trash types in separate bags.

5. Select the four types of items you estimate make up most of the trash by weight. Use one of the following methods to determine the exact or approximate weight of each type:

a) If you have a grocery scale in your classroom, weigh the items.

b) If you have a bathroom scale:
- Stand on the scale. example:
  What is your weight? .....100 lbs.
- Pick up a bag.
  Now what is your weight? ..102 lbs.
- How much does the bag weigh?..... 2 lbs.

c) If you don't have a scale, find objects in the classroom that are of a known weight. Compare the weights of your object and the trash (use a balance if you have one). Estimate the weight of the trash.

6. Calculate the volume of trash in each bag by measuring the width, length and depth of items in it. How might volume differ if the glass, cans or boxes are crushed? Does weight change if volume changes?

7. How do your calculations compare with the predictions you made in step 1?

8. How much trash does your class throw out in a day, week, month and school year by weight, volume and number? Calculate the average amount each student throws out in one day.

9. How much space will one school year's-worth of your class's garbage fill if the garbage is not compressed? Calculate the volume of your classroom. If you didn't remove any of your class's trash from the classroom, how much of the room would be filled with trash by the end of the year? How much room would be left for you?

10. If the number of students in your class is average for your school, calculate how much trash your school generates each school year. Discuss:
- Do you think your class makes a lot of trash? Not so much? Explain reasons for your response.
- When the trash from each class in your school is added together, do you end up with a lot of trash? Explain reasons for your response.

11. Investigate where your school's trash is taken. (See activity: Where Has All the Garbage Gone?)

Pre- and Post-Activity Questions:
- How much trash do you think your class throws away each day?
- What types of trash do you think your class throws away on a typical day?
- What happens to your school's trash?

Part 3 — Trash or Treasure?

Goal: To have students find out why, how and where they should recycle or reuse what they typically throw away.

Subjects: Science, social studies, language arts, environmental education, home economics, marketing.

Grades: 4-12

Materials:
- same as Part 2

Procedure:

1. Is there anything else you can do with what you throw away? List your ideas. Most of them will fit into one of the following four categories: reuse, recycle, recover energy, landfill. Write these four categories on the board. What trash items might fit best into each category? List them under the proper category heading.

2. Do a) and/or b), then answer the discussion questions:

a) To the teacher: Give each student a copy of the following checklist to fill out, or put the list on the board and work through it as a group. For younger students, you may want to use pictures of the items listed below. Feel free to add your own items.

Directions:
Put an X next to items you threw in the wastebasket this week.

____ Paper bag
____ Newspaper
____ Book
____ Magazine
____ Paper milk carton
____ Other paper
____ Napkin
____ Aluminum can
____ Apple core
____ Old clothes
____ Plastic milk carton
____ Tin can
____ Glass jar
____ Gum wrapper
____ Orange peel
____ Plastic bag
____ Broken toy
____ Grass clippings
____ Other

Now circle all the items you think could have been reused or recycled.

Discuss:
- What items did you circle?
- How could you have reused items?
- Did you wonder whether the napkin was paper or cloth? What difference might this make?
- What could you have done with the recyclable items?
- What could you have done with apple cores and orange peels?
- Which items are difficult to reuse or recycle? Why?
- Should we as a society be making products that aren't reusable or recyclable?
- Should items that are wrapped in difficult-to-dispose-of packaging cost more?
- Did any of your classmates reuse or recycle any of the items you circled?
- How did they reuse or recycle the items?
- Was reusing or recycling them easy to do? Why or why not?
- What do you think happens to the items you didn't circle?

b) Sort the items that your class threw out in one day (see Part 2) into the following categories: reuseable, recyclable, other. Discuss:
- Why did you place each item in the category you chose?
- Does your class recycle any of the items?
- Should your class recycle them? Why?
- Are there some items your class could recycle but doesn't? Why doesn't your class recycle them?
- Are there places in school aside from the classroom where you discard trash during the day? Think about how much food and how many food wrappers, cans and bottles you discard at lunch, how many paper towels you use to dry your hands, etc.
- What happens to the items that aren't reuseable or recyclable?

3. Investigate where in your community you can take items to be reused or recycled.
- How can you find out about local recycling programs? (Contact: local natural resources and environmental protection agencies, glass manufacturers, recycling businesses, municipal public works departments, used furniture and clothing stores and environmental organizations.)
- Make a list with the following information about the businesses or organizations that recycle: name, address, telephone number, materials recycled, hours of operation, whether the organization will pay you for materials, any other useful information. This information is available in: **Wisconsin's Community Recycling Collection Programs Directory** and **Markets for Wisconsin's Recycled Materials** (see Resources).

4. Investigate and discuss:
- What are some advantages of recycling? (*Conserves* natural resources, saves energy, protects the environment, can make money, creates jobs for people involved in recycling and reduces our dependence on imported materials.)
- What are some disadvantages of recycling? (May cost money, takes time, takes space for storage, takes away jobs from people who make new products and depends on recycling markets.) (See activity: The Cost of the Toss.)
- What are the pros and cons of energy recovery and landfilling?

5. Brainstorm the steps your class might take to design and implement a recycling project for your classroom or school. (See activity: Time for Action.) Select a project that is feasible. For example, collect and recycle paper from the school's copy machine and classrooms. Who can you contact to help you with your project?

6. Consider doing your project!

Pre- and Post-Activity Questions:
- What is recycling? What are reuse, energy recovery and landfilling?
- What types of solid waste can be recycled, reused, recovered or landfilled?
- What can you do in your school to recycle solid waste?

Part 4 — Cutting Class Trash

Goal: To have students realize that reuse and recycling of materials aren't the only or main solutions to the solid waste problem. A key step is to cut down on the use of materials that become solid waste.

Subjects: Home economics, social studies, mathematics, science, environmental education.

Grades: 5-12

Procedure:

1. In what ways can you reduce the amount of trash you throw out at school? Don't forget to consider waste from the artroom, shop, lunchroom, etc. Write your ideas on the blackboard and request that it not be erased for one week.

2. For one week, cut down on your use of paper, food packaging and other materials. Refer to the suggestions on the blackboard. Note: It isn't fair to "cut down" by throwing things out in other trashcans in the school.

3. At the end of each day, calculate the amount of trash and list what individual items make up most of the trash. (See Part 2 for instructions.)

4. Compare your findings with the amounts calculated in Part 2. Calculate:

- Did you throw out less trash when you tried to cut down? How much less?
- If your class cut down on use of materials for the school year, how much less trash (in pounds) would you send to the landfill?

Discuss:

- How easy is it to cut down on how much you use?
- Do you feel that it is worth doing? Why?
- Will you continue to cut down on your use of materials, or is this class activity a one-shot deal?

Pre- and Post-Activity Questions:

- How can you reduce the amount of trash you generate in your class/school each day?

Going Beyond:

- Take home a copy of the checklist and questions from Part 3 and fill it out. Note to teacher: Include a cover letter to parents explaining that the class is studying solid waste and recycling, and that you would like them to help their children see what kind of solid waste is generated at home. Discuss:
  - What did you find out about what your family throws away?
  - How do you feel about your findings?
  - What ideas do you have for what you could do with the trash generated at home?
- Trace the "afterlife" of one of the items on the checklist from Part 3. For example, what happens to the plastic bag or paper milk carton after it's taken to the landfill? Does it decompose? Does its decomposition create harmful byproducts? What impacts might its decomposition have on air, soil, water and health?
- Create a reusable item from something you're going to throw away.
- Investigate what used materials organizations like the Salvation Army and Goodwill Industries need and what they do with the materials they receive.
- Discuss the role of yard sales, garage sales or tag sales in recycling and reusing materials.
- Investigate how the amounts and types of wastes generated by a bank, grocery store, clothing store and hospital differ. How does each business dispose of its waste? Do any recycle materials?
- Americans generate more trash per person and more trash in total than the people of any other country in the world. How do you feel about this?
- Research and report on waste disposal habits of other countries. How do they deal with solid waste? Why don't they make as much trash as Americans?

Right in My Hometown

Part 1 — Natural Resources: Handle With Care *

Goal: To have students examine their own use of *renewable* and *nonrenewable natural resources,* determine which are essential for their survival and suggest ways they might change their lifestyles to make more careful use of natural resources.

Subjects: Language arts, science, social studies, environmental education, industrial education.

Grades: 6-12

Procedure:

1. What is a natural resource? List several examples.

2. Define the terms "renewable" and "nonrenewable" resource. (Some renewable resources are: solar energy, water, food and wood. Some nonrenewable resources are: petroleum, tin, bauxite, coal, copper and lead.)

3. Do a, b or c below:

a) List the products you used or consumed during a specific time period, e.g., between the time you got home from school yesterday and the time you went to bed; between the time you got up this morning and the time you left for school.

b) Describe a scenario or event and as a group, list what products were used.

c) Have the teacher select and read a story in which people use a variety of products. As a class, list what products were used.

Discuss:

- Which products are made of: renewable resources, nonrenewable resources?

4. Classify each product as: essential to survival, necessary for maintaining my present lifestyle, a luxury. Discuss:

- What criteria did you use to define what is essential, is necessary for maintaining your present lifestyle or is a luxury?
- Which, if any, items listed in the "essential" category are really not essential for survival? Explain your response.
- Do you think your parents or grandparents would place the products in different categories? Why or why not?

5. After discussing the lists, suggest alternatives for each item, making an effort to replace items that you think are inefficient or wasteful with items that are less wasteful. Discuss:

- Would using alternatives increase your use of renewable resources? (e.g., switching from aluminum foil to wax paper.)
- Would using alternatives increase your use of nonrenewable resources? (e.g., switching from paper cups to most plastic cups.)
- How might changes in the production and consumption of these products influence the economy and the environment?

6. Look at the list of items you listed as luxuries. Which items could you give up without a major change in your lifestyle?

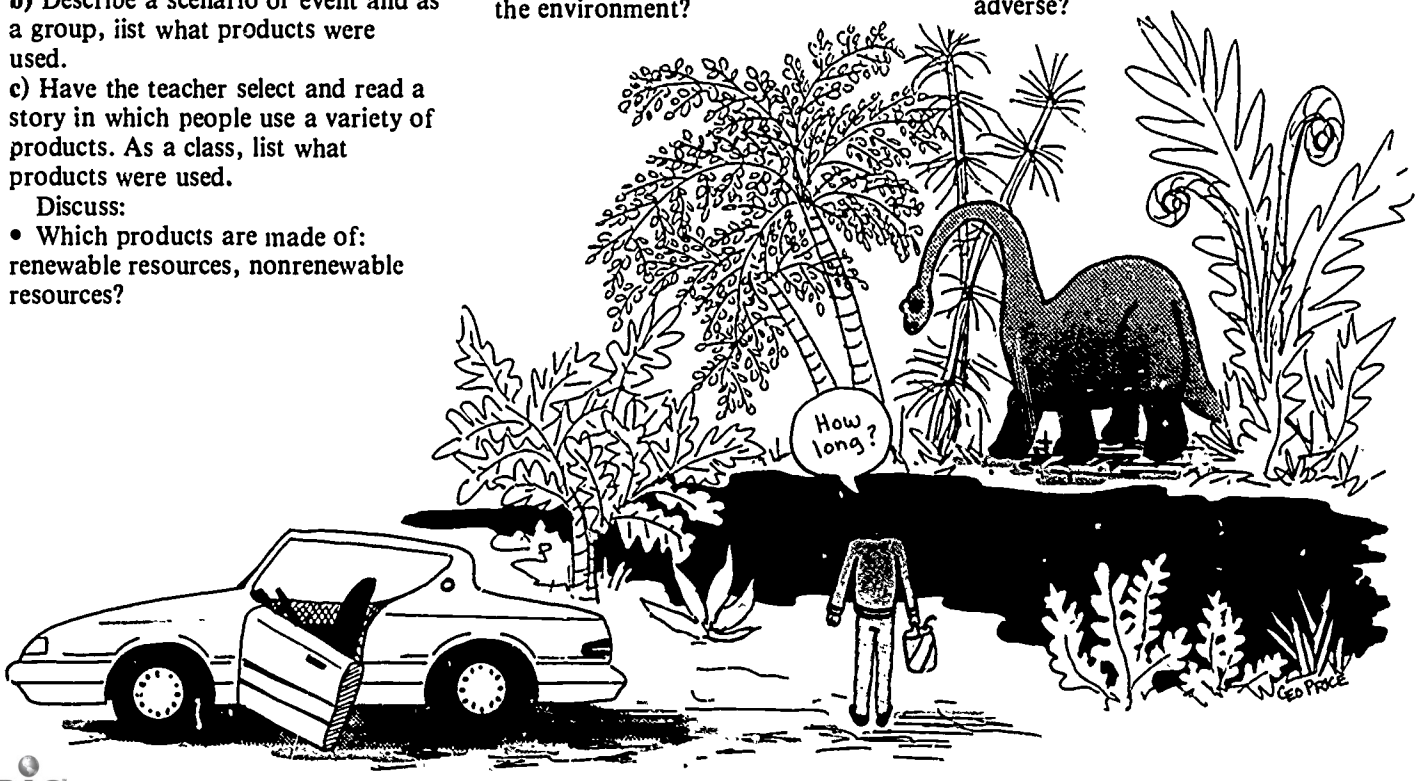
7. Make a list, beginning with the easiest item to give up and ending with the most difficult. Could you give up the top three items on this list for a day, week or month? Try it. How do you feel?

8. Think of several ways to reuse or recycle items you decide you can't give up.

9. Identify some of the economic, cultural and environmental impacts of any changes you make or recommend. Consider the implications if your entire family, school, community and country made such changes.

Pre- and Post-Activity Questions:

- Define and give examples of: natural resource, renewable resource, nonrenewable resource.
- List four items you use that aren't essential for your survival. What impact does their production or disposal have on the environment? Would you be willing to give them up if you discovered that the impact is adverse?

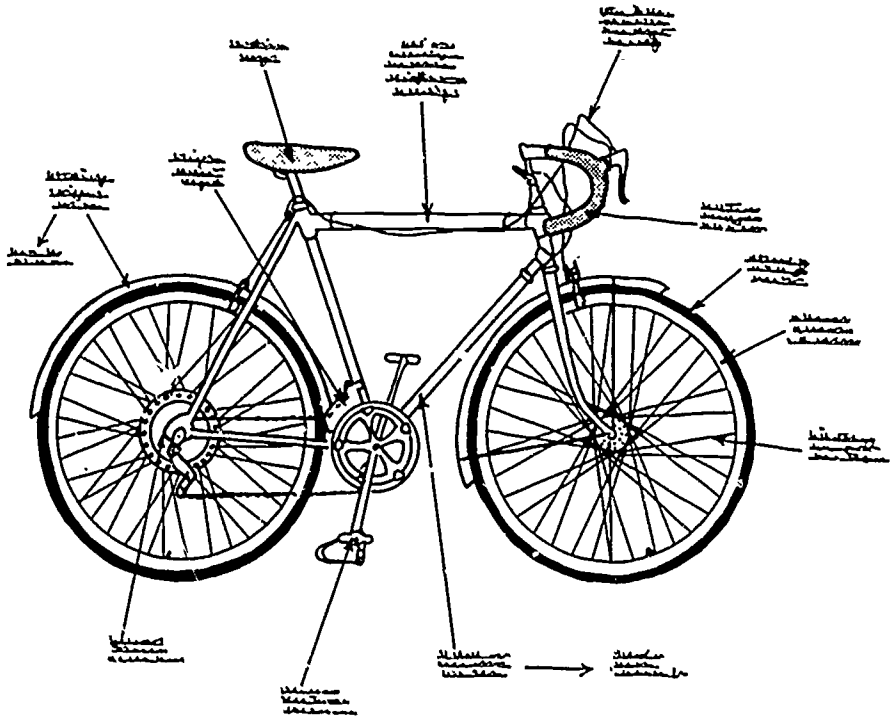


Part 2 — Biography of a Product

Goal: To have students investigate the natural resources required to make a product that is manufactured in their community, determine whether the resources are renewable or nonrenewable and consider the impacts production has on the environment (locally and elsewhere).

Subjects: Social studies, science, health, language arts, environmental education.

Grades: 6-12



Procedure:

1. Select one product that's made in your community. For example, bicycles are made in Waterloo, batteries and bologna in Madison, pens in Janesville, soy sauce in Walworth, shoes in LaCrosse, computers in Chippewa Falls, tires in Eau Claire, ships in Sturgeon Bay, beer in Milwaukee, glass in Burlington and cheese and paper in many towns.

2. List or draw on the blackboard the production steps and all the *raw materials* required to make the product. Contact or visit the manufacturer if you need more information about the materials and process used to make the product. Discuss:

- Are more raw materials required to make your product than you expected?
- Where did the raw materials come from? Is the source in your town, state or country?
- What amounts of these raw materials are available?
- What happens to the environment when the raw materials are extracted from the earth or harvested? Does the process produce pollutants or destroy land or ecosystems? How might it affect people living in the area?
- Were the raw materials changed (refined) before they got to your town?
- Were there any by-products made from processing the raw materials? What is done to these by-products?
- What effects does each step in the manufacturing process have on the environment?

3. Categorize the product as: essential to survival, necessary for maintaining my present lifestyle, a luxury. Discuss:

- What criteria did you use to make your decision?
- What impacts does *use* of the product have on the environment?

4. Describe what happens to the product after you use it. Discuss:

- Can it be used up or will it wear out?
- What will you do with it?
- Can the product or its parts be reused or recycled in some way? How?
- Will the product or its parts decompose if buried in a landfill?
- What effects does disposing of this product have on the environment?
- Can it be safely burned to produce energy? Does burning it release harmful chemicals?
- Who pays for disposing of the product?
- Who is responsible for disposing of it?

Going Beyond: Investigate answers to the following questions by checking books, articles and magazines, or writing to agencies or organizations for information.

- What natural resources used by the U.S. come from other countries? How much of each resource is imported?
- How does importing raw materials influence: U.S. and world economics, politics and security; the local and global environment; social systems and jobs in the U.S. and other countries?
- What used, recyclable materials (e.g., newspaper, scrap metal) does the U.S. export to other countries? Why does the U.S. export these materials? Why do the other countries import these materials?
- How long will known reserves of coal, wood, oil, iron, copper, water, bauxite, natural gas and zinc last if we continue to use them at present rates? Are any of these renewable resources? What might happen as we begin to use up these resources? (Investigate: offshore oil development; mineral exploration in Antarctica and world political implications; the coal economy of Kentucky and West Virginia; U.S. oil interests in the Middle East.)

Where Has All The Garbage Gone?

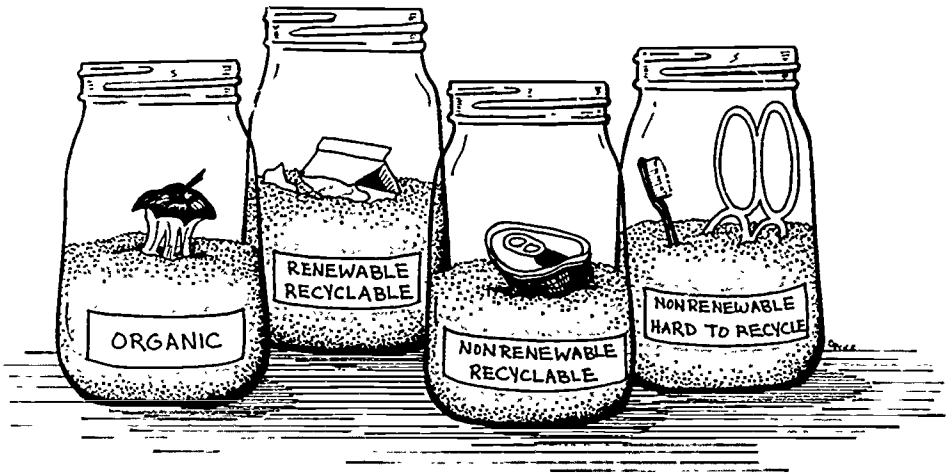
Part 1 — Making a Mini-Landfill *

Goal: To have students examine the materials that comprise the products they use, describe whether these materials are renewable or nonrenewable resources, observe what happens to materials when placed in a landfill and decide whether they should be disposed of in a different way.

Subjects: Science, social studies, environmental education.

Grades: 4-6

Materials:
- four large clear glass jars
- soil
- miscellaneous solid wast
- crayons
- masking tape



Procedure:

A) **1.** Choose one item you threw away today. What is your item made of? Into which of the following four categories of solid waste does your item fit?
a) organic (e.g., potato peels)
b) renewable resource/recyclable (e.g., newspaper)
c) nonrenewable resource/recyclable (e.g., aluminum cans)
d) nonrenewable resource/hard to recycle (e.g., plastic toothpaste tube)

2. What happens to the item you threw away? Discuss:
- Where is away?
- What is a landfill?
- How might the material that a piece of trash is made of determine how you should dispose of it?

3. List ways you can avoid disposing of your item in a landfill.

4. If your goal is to save natural resources and reduce solid waste, from which category (a-d) would you buy products? Which category would you avoid?

B) **1.** With crayons and masking tape, label each glass jar with one of the four category headings above.

2. Fill each jar about half full with soil.

3. Sort each miscellaneous solid waste item into its proper category (a-d). Put a small sample of each into the jar with the corresponding label. Cover with soil and keep damp with water. Leave the lid off and place the jar on a shelf away from people and out of direct sun. Stir occasionally.

4. Predict what you think will happen to the solid waste in each jar. Record your predictions.

5. Observe and record what changes occur during a 2-3 week period, if any. Discuss:
- What happened to the items made of organic and renewable resources?
- What happened to the items made of nonrenewable resources?
- How did what happened compare with your predictions?
- What comparisons can you make between your mini-landfill and a real landfill?

C) **1.** Keep a record of your family's purchases from two trips to the grocery store. Divide the items into the four solid waste categories listed above. Discuss:
- What does your family do with the waste from its store purchases?
- Is there anything else your family could do with this waste?
- Could you substitute items from "d" with items from "a-c?" Is this a worthy goal? Why?
- If your goal is to reduce solid waste, which items would you eliminate from your shopping list?

Pre- and Post-Activity Questions:
- Define and give examples of: organic material, renewable resource, nonrenewable resource.
- What do you think will happen to items made of renewable or nonrenewable resources when they're dumped in a landfill?
- List four items you use everyday that you could recycle.

Part 2 — Follow That Garbage!

Goal: To have students see where their garbage goes and investigate their community's solid waste disposal issues.

Subjects: Social studies, science, health, environmental education.

Grades: 4-12

Procedure:

1. **a)** Contact your municipal landfill and obtain permission for your class to visit it. Arrange for the site manager, owner or other resource person to guide your trip and be available to answer questions. A list of local waste disposal sites can be obtained by contacting your DNR district solid waste management specialist. (Be sure to follow all safety precautions while visiting the site.)

b) If you're unable to take a field trip, ask a guest speaker to come and discuss local solid waste management with your class. Resource people you might contact are: waste disposal site operators, private waste haulers, Extension agents, environmental health officers, government officials, environmental organization representatives, DNR and local solid waste managers and public works personnel.

2. Before visiting the municipal landfill or having a guest speaker. develop a list of questions you would like answered. Investigate possible answers to your questions. Then send the questions to the guide or guest speaker in advance so they can prepare responses. Questions to consider include:

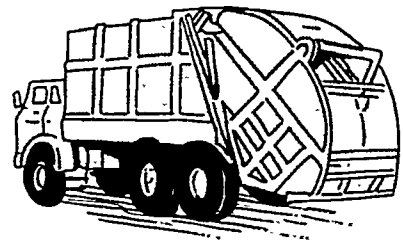
- Where is the garbage from your school or home taken?
- How does it get there?
- Why was the landfill located on this site? What factors must be considered when a site is selected? What tests were done at the site before it was opened? What were the results?
- What laws govern solid waste disposal in your community?
- Is the landfill an engineered or unengineered site?
- Who owns the landfill? When did it open? What was the cost of constructing it?
- Who does the site serve? Who can bring wastes to the landfill?
- What is the fee for using the landfill?
- How much does your family pay for trash collection?
- How much does it cost to take care of trash once it's in the landfill?
- How much solid waste is disposed of at this site daily, weekly and yearly?
- Who works at the site? Do they monitor what is dumped?
- What happens to the trash once it's dumped in the landfill?
- Are any of the materials hazardous? Are there regulations or procedures for dealing with hazardous wastes?
- What is the land adjacent to the landfill used for? Is the landfill a problem for nearby landowners? If so, in what ways?
- How is the site managed for control of blowing trash, odors, noise, animals, erosion, surface runoff and leachate?
- Are tests performed regularly at the site (groundwater, soil, methane gas)? What are the results?
- Is there a resource recovery program at the site? If so, what is recovered? How?
- What impacts does resource recovery have on the economy and environment?
- How many years is the landfill expected to last? How much time does the community have to find a new site?
- How will the landfill be cared for after it is closed? Who is responsible for its care? What will be done with the land at the site?
- What alternatives for waste disposal has your community considered for the future?
- When will these alternatives be carried out?
- How can you participate in making the decisions that develop future waste management plans in your community?

3. Now that you know more about landfills:

- How do you feel about them?
- Are they the best way to dispose of trash? What are possible alternatives?
- What can you do to help reduce solid waste?

Pre- and Post-Activity Questions:

- Where is the trash you throw away taken?
- What eventually happens to your trash there?
- What is the difference between a *dump* and a sanitary landfill?



Going Beyond: For older students...

- If your community has a solid waste incinerator designed for energy recovery, visit it. What are the pros and cons of incineration?
- Investigate waste disposal techniques, problems and laws in other parts of Wisconsin, the U.S. (e.g., New Jersey, California) and the world. Consult individuals, books, newspapers, magazines and state agencies.
- Survey your parents' knowledge and attitudes about solid waste.
- Conduct a hearing to decide where to locate a landfill in your community. Take on the roles of people involved in the decision: local landowners, politicians, industry representatives, environmentalists, waste managers and others.
- Landfills often have been developed in wetlands, although this is now illegal in Wisconsin. Consider the following questions:
- Why were landfills often located in wetlands?
- What problems might exist with placing landfills in wetlands?
- Are wetlands an important ecosystem? Why?

Composting: A Great, Rotten Idea

Part 1 — Is It Rotten?

Background: When we mention "recycling," we often think of recycling glass bottles, aluminum cans and newspapers. But another 30% of the household garbage we throw out also can be recycled. These recyclables are food scraps, leaves, grass clippings and other *biodegradable* organic wastes. Organic wastes can be recycled by composting. Simply stated, composting creates optimal conditions for decomposition to occur. Decomposition is the biochemical process by which bacteria, fungi and other microscopic organisms break organic "wastes" into nutrients that can be used by plants and animals. Decomposition occurs in nature whenever a leaf falls to the ground or an animal dies. It is essential for the continuation of life on earth. The result of decomposition in a compost pile is a nutrient-rich humus that is excellent for improving soil quality and plant growth.

Goal: To have students investigate the pros and cons of composting.

Subjects: Science, health, environmental education, vocational agriculture, home economics.

Grades: 4-12

Materials:
- rotting log, grass clippings, leaves or food scraps

Procedure:

1. Define: recyclable, biodegradable. List items that are recyclable and/or biodegradable. Discuss:
- Are there recyclable materials that aren't biodegradable? Are there biodegradable materials that aren't recyclable?

2. Feel, smell and look at the rotting log, grass clippings, leaves or food scraps. What words would you use to describe these materials? List these words. Do the words have positive and/or negative connotations? Why?

3. Explain what is happening to the rotting material. Discuss:
- What is the natural process that breaks biodegradable material into particles that can be used again by plants and animals? (decomposition)
- What organisms assist in this decomposition process? (fungi, bacteria, earthworms, springtails, mites, etc.)
- What will your rotting material finally become? (humus)

4. Imagine a world where decomposition doesn't take place. Discuss:
- What would happen to organic materials like dead animals, leaves or sewage?
- Could plants and animals survive if decomposition doesn't occur? Why or why not?
- Is decomposition important? Why?

5. Now think of words to describe rot or decomposition. List them. Do the words have positive and/or negative connotations? Why?

6. List items you throw away that are biodegradable. Discuss:
- How might you and your family recycle these materials?
- What is composting?
- Why do you think people compost household organic wastes?

7. What are some benefits of composting household food and yard wastes? For example:
- Doesn't require the purchase of expensive plastic bags often used for disposing of household and yard wastes.
- Saves the cost of transporting wastes to and handling wastes at the landfill. Wisconsin discards 2.4 million tons of compostable waste every year. It costs $50 per ton to collect wastes in urban areas and $15-$25 per ton to dispose of them. How much money do Wisconsin citizens spend each year disposing of their compostable wastes?
- Saves space in the landfill. Wisconsin's landfills are filling up fast. Within 10 years, most will be filled to capacity. Thus, Wisconsin already has a serious problem — where will we put all our waste?
- Reduces pollution from landfills.
- Creates nutrient-rich humus you can use to fertilize and improve the texture of your yard and garden soil; saves money you might spend on mulch or fertilizer.

8. What are some possible problems with composting? What suggestions do you have for solving the problems? For example:
- It's too much work. Mowing the lawn and washing the car are work, too, but we choose to do these activities because they're satisfying — so is composting! And composting has a positive impact on the environment, which can make us feel good.
- You'd have to run outside everytime you eat an apple or peel a potato. Just place scraps into a plastic container with a lid. Keep the container in or under the kitchen sink, then take the waste to the compost pile whenever the container is full.

• It's easier to use the trashbag or garbage disposal. Once you make it into a routine, composting is easy, too. It can make you feel good about doing something positive for the environment by using instead of wasting the fertilizing potential of your garbage. Also, landfilled yard wastes and food scraps take up space and may release harmful methane gas. Food waste put down the garbage disposal ends up in the sewage system, where treating it can tax the system and costs money. If you can afford a garbage disposal, perhaps you can afford a "no work" composter. Easy-to-use, compact and attractive composting bins are available commercially. Contact your garden center or the DNR Bureau of Solid Waste Management for details.
• It might smell and attract rats. If you maintain your compost pile according to basic guidelines in publications like **Home Composting: Reap a Heap of Benefits** (see Resources), your pile shouldn't smell or attract rats.
• The neighbors might not like it. If you locate, build and maintain your pile properly, it shouldn't be offensive. Take the opportunity to explain what you're doing to your neighbors and why you feel composting is important.

9. How would/do you compost your household wastes? Where can you find information to help you? Write or call for information.

Part 2 — Readin', Rottin' and 'Rithmetic: Classroom Composting

Goal: To have students learn about recycling in nature and actually recycle organic matter by composting.

Subjects: Science, health, environmental education, mathematics, home economics, vocational agriculture.

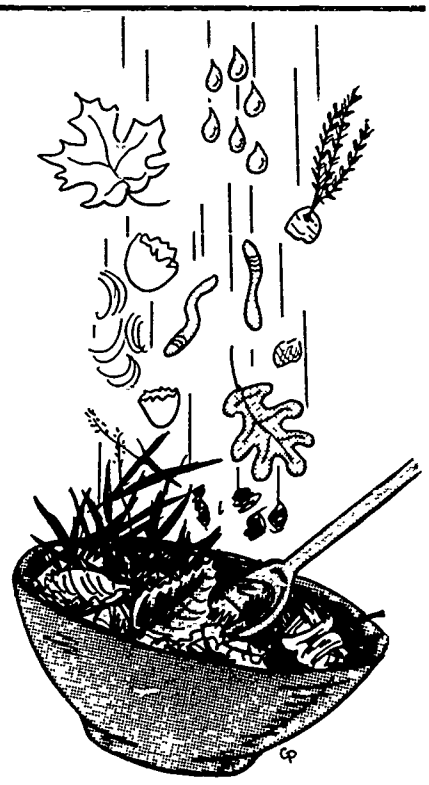
Grades: 4-12

Materials:
• fish aquarium
• organic waste materials (be sure to add a variety of materials, not all one kind, i.e., use sawdust, hair, wood ash and leaves in addition to food scraps; avoid meat scraps, fats and oils, which inhibit decomposition and in outdoor compost piles can attract dogs, rats, raccoons and other animals)
• lawn fertilizer that contains nitrogen (but not herbicides or insecticides); manure and green grass clippings also contain large amounts of nitrogen. A ratio of 25-30 parts carbon to 1 part nitrogen is ideal.
• soil
• 1-2 dozen red earthworms (obtain from yard, garden, school grounds or local bait shop)
• thermometer
• trowel or large kitchen spoon (for turning, or aerating, the pile)

(Note: Air circulation is important to decomposition, thus the best compost bin is one with wire or screen sides. Mass also is important, since approximately one cubic yard of compost is needed to generate good decomposition temperatures (104-170°F). Thus, an aquarium, with its small size and glass sides, isn't the best compost container. Consider constructing an outdoor compost pile with wire sides on the school grounds. Composting instructions are available from: DNR Bur. of Information and Education.)

Procedure:

1. What "ingredients" do you think are needed to construct a compost pile? Why? List ingredients. For example:
• **soil:** contains microorganisms that help decomposition.
• **organic wastes:** such as leaves, food scraps and grass clippings. Wastes should be varied, including materials with both carbon and nitrogen. By alternating layers of high-carbon and high-nitrogen materials, you can create good environmental conditions for decomposition to occur.
• **nitrogen:** many of the organisms responsible for decomposition need nitrogen, thus nitrogen is necessary for rapid and thorough decomposition. Nitrogen is found naturally in many organic wastes, and in many commercial fertilizers.
• **worms:** they eat the waste, helping to break it down; make droppings, which enrich the soil; tunnel through and aerate the waste, facilitating decomposition; and eventually die and become part of the compost.
• **water:** necessary for normal functioning of life. Too much water



in a compost pile may make it soggy and slow decomposition by reducing needed oxygen.
• **air:** the biological activity of fungi, bacteria, small insects and other organisms results in decomposition. Most biological processes require adequate amounts of oxygen.
• **time:** decomposition takes time. To speed up decomposition, aerate your pile every few days; otherwise, just leave it and wait.
• **heat:** heat is produced by chemical reactions resulting from increased

biological activity that occurs during decomposition. Heat helps sanitize compost by killing certain organisms (e.g., weed seeds, pathogens, harmful insect larvae).

• **mass:** in order to generate enough heat for optimal decomposition, the pile must contain at least one cubic meter of organic material. Thus, the temperatures generated in an aquarium compost pile may be different from those generated in one that is larger.

2. Design a plan for making a mini-compost pile in the classroom. Decide which ingredients students will provide and which will be supplied by the teacher. Set a date for constructing your pile.

3. Suggestions for creating a mini-compost pile:

a) Chop the organic wastes into small pieces. You can leave some large pieces of the same materials to compare rates of decomposition between large and small items. Why might there be a difference?

b) Alternate layers of the materials as follows (amounts are approximate): inch of soil, two inches of organic waste, sprinkle of fertilizer, sprinkle of water, repeat.

c) Cover with an inch of soil. Water the pile enough to make it moist but not soggy. It should feel like a damp sponge (it feels moist, but you can't squeeze water out of it).

d) Add the earthworms and observe their behavior.

e) Place your compost pile where it will be at room temperature (not in direct sun).

4. Place the thermometer in the middle of the pile. Wait an hour or so, then record the temperature.

5. Record the temperature from the same location and depth, and at the same time each day. Why is it a good idea to be consistent with location, depth and time of recording? Does the temperature change? Why or why not? Make a graph to show your temperature results.

6. Gently mix the compost once a week to aerate it. A good time to turn the compost is after the temperature peaks and begins to drop. Why? Be sure to record the temperature before you turn the compost that day.

7. Be patient. Occasionally check the moisture and add water if needed.

8. Make a chart to help you keep a daily record of temperature and other observations during the next month or two. Observe:

• Which materials break down the fastest? Slowest? Why?
• Are there any odors? Why do you think decomposition has an odor?
• Does the texture of the compost change? In what ways?

9. Once the materials in your compost pile have decomposed into humus, conduct the same feel, smell and look test that you did in Part 1, #2.

10. Now decide what your class should do with this rich soil. When you clean out the aquarium, should you: dump the humus in the trash; take it outside and dig it into the soil; use it for growing plants in the classroom?

11. Discuss:

• How does composting reduce the amount of waste you would have thrown out?
• What do you think happens to organic wastes that end up in the landfill?
• Is the landfill a gigantic natural compost pile, or are there problems with placing large amounts of organic material in landfills?

12. Now that you have constructed and maintained a mini-compost pile in the classroom, how would you go about constructing and maintaining one at home?

Pre- and Post-Instruction Questions:

• What is composting?
• What are the necessary "ingredients" for a good compost pile?
• How is composting related to the concept of recycling?
• How can composting reduce waste?

Going Beyond:

• Create a compost pile as in Part 2, but also add manufactured items like a soda can, paper clip, bottle cap, aluminum foil, iron nail, pencil, crayon, paper, plastic bag, rubber band, etc. Predict rates of decomposition or lack of decomposition and observe actual changes, if any.

• Take a field trip to a local woods or park. Examine a rotting log or leaf litter. Place a sample of rotting humus in a white enamel pan and sort through it carefully, looking closely for "decomposers." What decomposers (insects, mites, fungi, etc.) can you find? What do you think they're doing? Read about their life histories. (Do activity: A Rottin' Place to Live, in booklet **Trees are Terrific.** See Resources.)

• Make a Berlese funnel to help you capture tiny soil animals. Examine them using a magnifying glass or binocular microscope. Make drawings of them and try to figure out what kind of animal they are. Read about their life histories. (See: **Soil Animals, Living Earth** and **The Natural History Guide,** in Resources.)

• Visit someone who maintains a compost pile. Why do they compost? What do they do with the compost? Have they had any problems? Would they recommend composting?

• Investigate what happens to the leaves your community discards each autumn. What do you think should be done with them?

• If your community has a municipal composting center, take a field trip to it. Be sure to prepare questions to ask the guide.

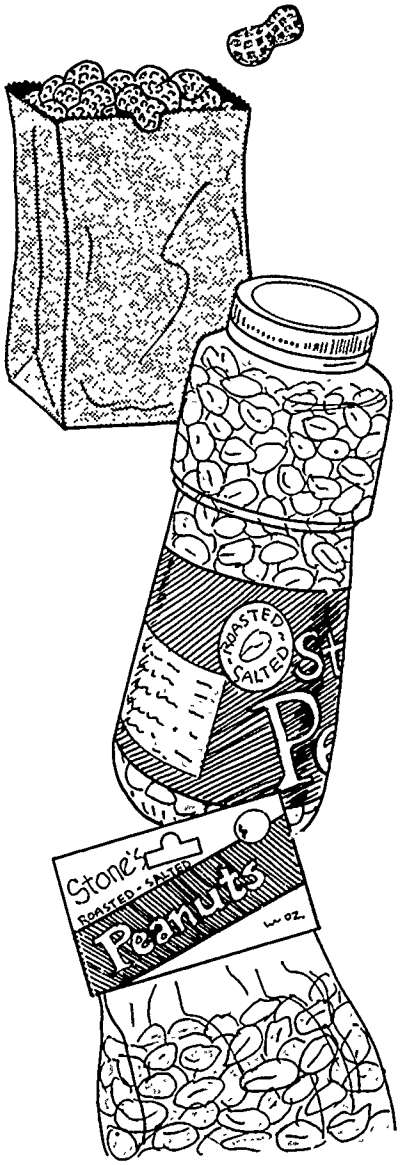
• Have students design experimental compost piles. For example, make a pile that: is low in nitrogen; lacks moisture; has little air circulation; or is made of a single ingredient (e.g., just grass clippings). Also create a good compost pile for comparison. Compare rates and temperatures of decomposition between piles.

• Fill flower pots with different soil types, including one type that has your humus mixed in. Plant seeds or grow seedlings in the pots. Make 4-5 pots with each soil type so that you're comparing more than one plant grown in each type (i.e., so that you have a large enough sample size to make a valid judgement). Do the plants in different soil types grow at different rates, with different vigor, color, etc? What are possible explanations for any differences?

Is It A Waste?

Part 1 — All Wrapped Up *

Background: Why do we buy one product instead of another? Often it's because of the packaging. Packaging accounts for 10-15% (and sometimes more than 50%) of the cost of a product and 40-50% of all consumer wastes. While packaging often is designed to protect merchandise, it also is designed to sell products. Excess and non-recyclable packaging add to our energy and waste problems. We can cut down on packaging.



Goal: To have students investigate the purpose of packaging and identify wasteful packaging.

Subjects: Home economics, marketing, social studies, language arts, health, science, environmental education.

Grades: 4-12

Procedure:

1. Bring in an example of food packaging. Discuss:
- Why is the product packaged? (To protect the product, protect health, prevent theft, provide advertising, provide convenience, promote purchasing, make the product look larger or more appealing?)
- Is the packaging essential or wasteful? Why or why not? What criteria are you using to make your decision?
- What influence do you think packaging has on the salability of the product?

2. Design a way to categorize the packaging. For example, sort it according to "natural" packaging (bananas, apples, peanuts); "older" packaging (paper bags, returnable bottles); and "modern" packaging (plastic wrap, styrofoam, plastic milk containers). Discuss:
- What happens to the packaging once the product is used?
- Which packaging is/isn't: recyclable, biodegradable?
- Which packaging is/isn't made from: recycled materials, renewable resources?
- What are the environmental pros and cons of making and disposing of each type of packaging?
- Which packaging would you label: most wasteful, least wasteful? Why?

3. Brainstorm ways that you could reduce the amount of packaging you purchase. For example, could you purchase products in bulk? How would this help reduce packaging? (A 3 ounce tube of toothpaste requires 50% more packaging per ounce than a 7 ounce tube.)

Pre- and Post-Activity Questions:
- List three examples each of recyclable and non-recyclable packaging.
- What criteria might you consider when deciding whether packaging is necessary or wasteful?
- What happens to most of the packaging you purchase? What do you think about this?

Part 2 — What's the Appeal? *

Goal: To have students quantify the number of times television and radio ads try to sell products for reasons not related to product quality and list some of the techniques advertisers use to promote products.

Subjects: Social studies, mathematics, language arts, home economics, marketing, environmental education.

Grades: 7-12

Procedure:

1. Find samples of different advertisements for the same type of item (soda, detergent, potato chips). Select ads for different name-brands and types of packaging. Discuss:
- Which product would you buy? Why?
- What is advertising? What is the purpose of advertising?
- Does advertising influence what you buy? How?
- Which advertisement do you like best? Why?
- Do your reasons have anything to do with the quality or function of the product?
- Do you purchase name-brand items instead of generic items? Why?

2. Discuss ways in which products are promoted on television, radio and in print. Analyze at least 25 ads. Note the following:
- What strategy does the advertiser use to sell the product?

• What is the advertisement really selling: convenience, health, sex appeal, status, fun, quality?
• Does the advertisement mention the packaging?
• Is the packaging reusable or recyclable?
• Does the ad suggest what you should do with the packaging?

3. Design a chart to help analyze characteristics of these ads. A sample follows (feel free to add other categories):

4. Make a composite chart that shows the results of all the surveys done by students. Discuss:
• Which marketing strategies were used most often to promote packaged products?
• What strategies were used that were not listed on the sample form?
• What usually happens to the packaging?
• Do you think the manufacturer of the product should be responsible for what happens to the packaging once the product is used? Why or why not?

Pre- and Post-Activity Questions:
• Name three reasons you buy one type of packaged product instead of another.
• How often are your reasons based on the quality or function of the product?
• Discuss ways in which advertisements may influence what you choose to purchase.

Name of Product	Television	Radio	Print (magazines, newspapers)	Other	Status	New and Improved	Convenience	Sex Appeal	Symbols	Self-Image	Famous People	Flashy Packaging	Band Wagon	Vague Pronouns	Keeping Up With the Joneses	Other

Part 3 — How Many Ways Can You Wrap An Apple?

Goal: To have students design packaging and advertising strategies to sell a product, analyze why they decided on their strategies and consider why they buy one product instead of another.

Subjects: Social studies, language arts, art, drama, environmental education.

Grades: 6-12

Materials:
• an apple or other object (hammer, child's toy, batteries) for each student or group of students. Each student or group should have the same item.

Procedure:
1. You have just gotten a job as an advertizing agent for an apple company (you can work either individually or with a group of other students). Your first assignment is to develop a packaging design and ad campaign to sell apples. Keep track of the reasons why you chose your particular design and sales pitch. Your campaign can consist of skits, poems, songs, posters or whatever you believe will sell the product.

2. Present your ad campaign to the class.

3. Display the "products" (numbered in some way). Vote for the apple you would buy (each classmember should vote anonymously on slips of scrap paper). Tally the results. Discuss:
• Why did you choose the product you did?
• How much packaging was involved in the "winning apple?" Was the packaging necessary? Why or why not?
• What influence does the packaging have on the quality of the product?
• Why was the product packaged?
• Who pays for the packaging?
• Who should pay for disposal of the packaging?
• Was the manufacturer of the product concerned about disposal of the packaging?
• If the manufacturer is primarily interested in selling the product, is it more important to package the item to sell than to package it to have low environmental impact? Are these two concepts mutually exclusive? Could you design a package that sells but doesn't use a lot of energy or resources to produce or dispose of?
• Who should pay for the disposal costs of packaging that isn't recyclable or reusable?
• Do you have any choices about how much packaging you purchase?

Pre- and Post-Activity Questions:
• Who do you think makes decisions about what packaging to use on a product?
• What main factors do you think they consider when deciding how to make their product sell?
• Why do you think people buy products that have a lot of packaging?
• How often do you think manufacturers consider the impacts of packaging on the environment?
• Do you have to purchase highly packaged items?

Part 4 — Packaging: Is It A Waste?*

Background: In 1974, the Environmental Action Foundation published research showing that the energy used to produce the packaging used annually by McDonald's fastfood restaurants was equal to the amount of energy required to supply the people of Boston, Washington, San Francisco and Pittsburgh for a year.

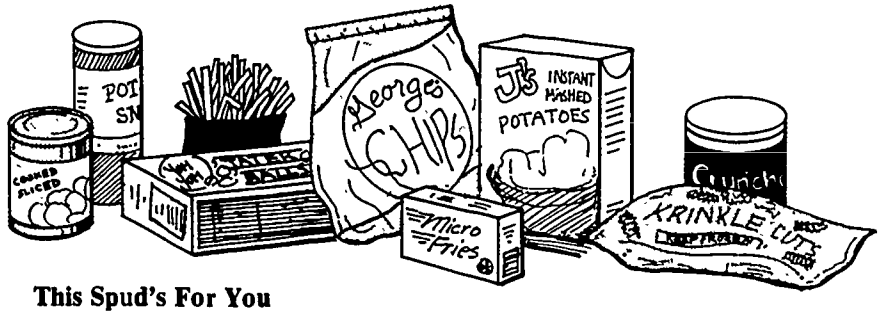
Goal: To have students consider solutions to the problems of energy and resources wasted due to excessive packaging and become aware of how complex and energy-intensive food processing has become.

Subjects: Home economics, social studies, language arts, marketing, mathematics, environmental education.

Grades: 7-12

Procedure:

1. Examine the following chart. Discuss:



This Spud's For You

Product★	Package Size	Price	Price per Pound
Fresh Idaho Potatoes	10 lb.	$2.99	$ .30
Fresh Idaho Potatoes	5 lb.	1.98	.40
Fresh Idaho Potatoes	loose	.59	.59
Kohl's Canned Sliced Potatoes	8.5 oz.	.33	.62
Orelda Tater Tots	4 lb.	2.99	.75
Orelda Tater Tots	2 lb.	1.69	.85
Orelda Tater Tots	1 lb.	.99	.99
Kohl's Crinkle Cut French Fries	5 lb.	2.99	.59
Kohl's Crinkle Cut French Fries	2 lb.	1.33	.67
MicroMagic Microwave French Fries	15 oz.	1.69	1.80
MicroMagic Microwave French Fries (3-3 oz. pkgs.)	9 oz.	1.25	2.22
Small Order McDonald's French Fries	2.5 oz.	.59	3.78
Betty Crocker Potato Buds	28 oz.	2.59	1.48
Betty Crocker Potato Buds	13.75 oz.	1.49	1.73
Betty Crocker Potato Buds	5.5 oz.	.65	2.08
Planter's Potato Crunchies	6.5 oz.	1.19	2.54
Durkee Potato Sticks	7 oz.	1.49	3.41
Durkee Potato Chips (8-9/16 oz. pkgs.)	4.5 oz.	1.29	4.59
Pringle's Potato Chips (reg.)	7.5 oz.	1.49	3.18
Jay's Potato Chips (twin pack)	8 oz.	1.39	2.78
Jay's Potato Chips (12-0.5 oz. pkgs.)	6 oz.	1.89	5.04

★All items priced on June 22, 1987, at Kohl's II Food Stores and McDonald's in Madison, WI.

- Which forms of the potato are most highly processed and packaged?
- Which are most expensive per pound?
- Which form of potato would you purchase if you were interested in reducing solid waste or saving money?

2. Working with a partner, choose a fresh food item to investigate, such as a potato, tomato or corn. If possible, go as a class to the grocery store (or go independently after school). Calculate and/or record the price per pound of the fresh product as well as 5-10 items that are processed forms of the product. Discuss:
- Which form of your food item is most expensive per pound? Why?
- Which do you think uses the most energy to produce?
- What relationships are there among cost and amount of processing and packaging?

3. Make a chart like the one above for the product you are investigating. Discuss:
- What conclusions can you make about the relationships among cost, processing and packaging?
- Which packaging do you think is least wasteful of energy and raw materials? Which is most wasteful?
- Does the product need the packaging?
- What do people do with the packaging?
- Which packaging: weighs the least per pound of product; takes up the least space in the landfill; decomposes most or least quickly; doesn't produce toxic materials when it decomposes?

4. Which of these products will you buy in the future? What criteria will you use for making your decisions about what to buy and what not to buy?

Pre- and Post-Activity Questions:
- What percentage of the cost of packaged foods do you think is due to packaging?
- Which of your favorite foods could you buy without packaging?
- How can packaging of foods be reduced?

Part 5 — What Can I Do To Change Packaging?

Goal: To have students identify steps that can be taken to affect the packaging options available in the marketplace and encourage them to act on an option (See activity: Time for Action).

Subjects: Language arts, social studies, environmental education.

Grades: 5-12

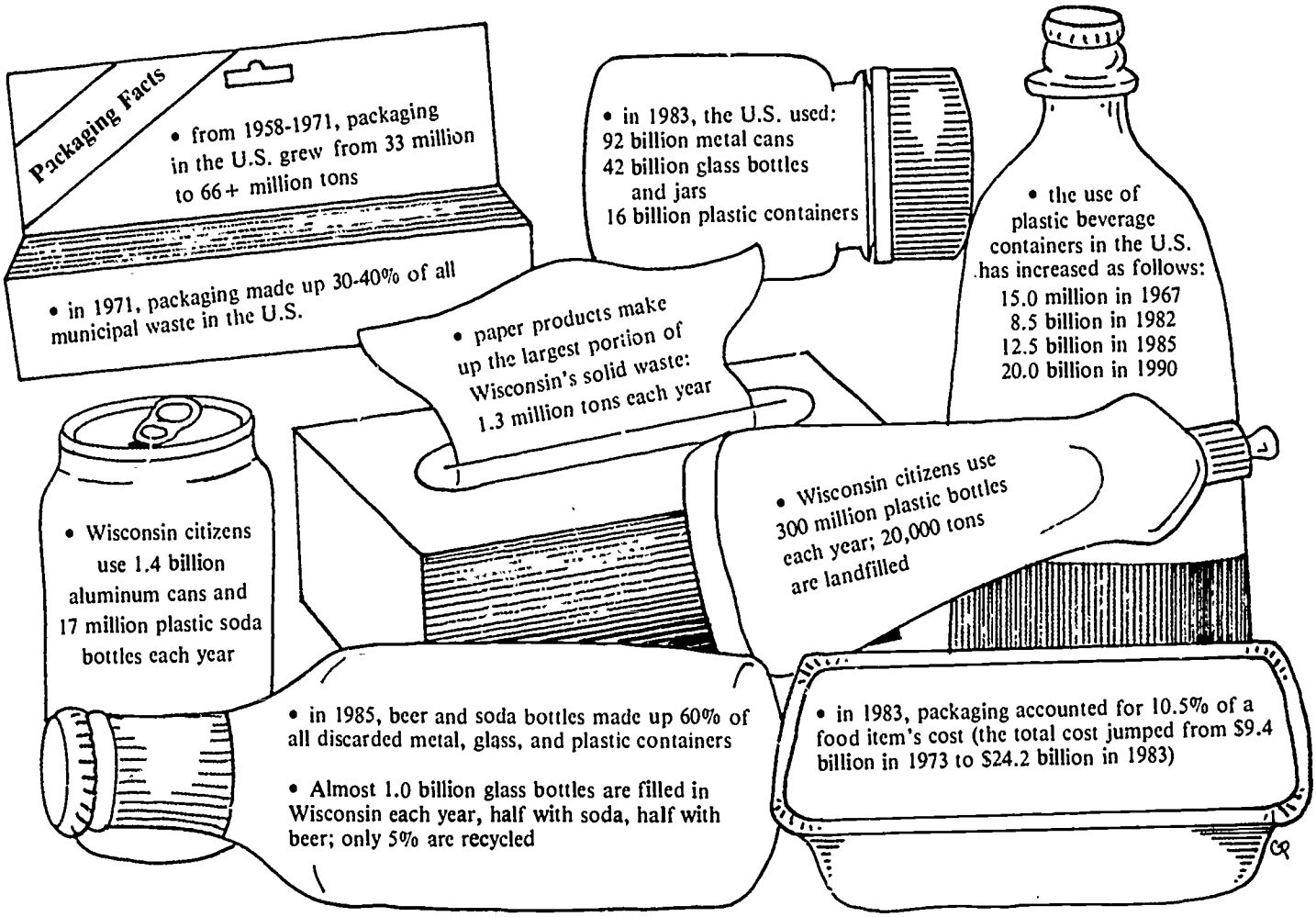
Procedure:

1. Brainstorm what you can do to encourage change in packaging procedures. List your ideas. For example:
- Write letters encouraging retailers to carry beverage containers that can be returned or recycled.
- Write to the manufacturers of an item with a particularly wasteful package and ask them to suggest ways you can reuse or recycle the packaging they are producing.
- Write to legislators urging them to require standardization of materials of which containers are made. This would make possible an expanded system of returnable or recylable containers.
- Organize a consumer's advisory committee to recommend packaging or bagging chan es in your local supermarket.
- If you are dissatisfied with a product's packaging, write the manufacturer and send a copy to the local Consumer Protection Division of the federal government or appropriate agency.
- Write to packaging companies urging them to use recyclable materials.

(For all of the above, be sure to request a response to your letters.)
- Refuse to purchase over-packaged items in stores and tell the manager why.
- Refuse to accept bags and extra wrappings from the store cashier and bagger and tell them why.

2. Do some of the things you suggest.

3. Evaluate your results. Discuss:
- Did you receive a response to your letter? If not, send another copy.
- Did the response you received address your concerns and answer your questions adequately?
- Do you feel that your action has had an influence on reducing unnecessary packaging or encouraging use of recyclable materials? Remember, even if your influence was small, every "drop in the bucket" counts.
- Who can you contact to assist you in your goal?
- Would you personally be willing to do without the conveniences and appeals of packaging? Why or why not?



Facts from: **Special Recycling Edition,** July-August 1985. *Wisconsin Natural Resources.* Vol. 8, No. 4.

Going Beyond:

• Read the following true-life scenarios. Based on what you now know about how packaging creates solid waste and how consumers are influenced by advertising, convenience, etc., analyze and discuss what is going on in each scenario. How do you think people in these scenarios might behave differently to reduce the amount of trash they discard?

Scenario 1:

Mr. Jones and his young son, Sammy, are at the convenience store to buy a gallon of milk. Mr. Jones picks up the plastic jug of milk and heads for the check-out. In the meantime, Sammy has been eyeing the candy, and asks if he can have some. Mr. Jones says yes, and Sammy places his choice (individually wrapped jaw-breakers) on the counter. The clerk rings up the purchase and puts the milk jug in a paper bag. Sammy demands his own bag for his candy, and the clerk looks questioningly at Mr. Jones. Mr. Jones nods to the clerk, who gives Sammy his own bag. Once out of the store, Sammy takes his candy out of the bag and throws the bag away. Mr. Jones does the same with his bag when he gets home.

Scenario 2:

Ms. Smith has just finished mowing the lawn and asks her daughter, Kate, to help rake the grass clippings and stuff them into plastic bags. Kate also rakes up some leaves that have blown into the shrubs. Ms. Smith and Kate haul the bags to the curb for garbage collection. Their neighbor, Carol, walks by and asks why they are putting the grass and leaves in plastic bags. Kate responds that she doesn't know how else you're supposed to get rid of them — people always dispose of them that way (she points to the house across the street, which also has thrown out grass in plastic bags). And besides, it's the way her mom asked her to do it. Ms. Smith explains that the ads on TV said bags were good to use for throwing away trash like grass and leaves. She buys the heavy-duty ones with the built-in tie because she had a coupon, and because the ad said they e tough to break and easy to use.

Scenario 3:

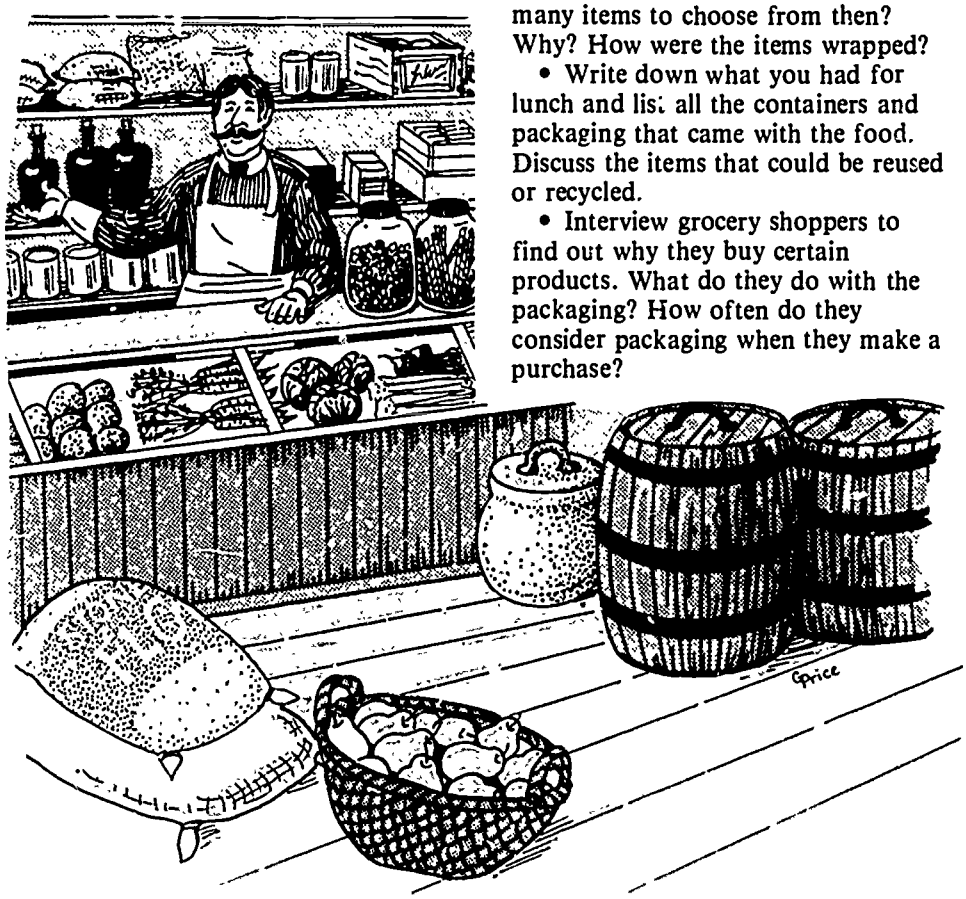
Luke and Jennifer are on their way home from school and are starving. They stop at the fast-food restaurant for a burger, fries and soda. They pay, pick up the bag with their order and go to the nearby park to eat. Luke opens the bag and takes out the sodas and paper napkins. He puts a plastic straw through the plastic spill-proof lid on his paper cup, then grabs for the cardboard container holding the fries. "You like ketchup?," he asks Jennifer, as he opens the plastic ketchup packet. Meanwhile, Jennifer is eating her burger, having stuffed the styrofoam box, designed to keep the burger warm, back into the bag. She adds some pepper from the little paper packet, but decides she doesn't need the salt she got, so leaves it in the bag. When they're finished eating, Luke and Jennifer put the garbage (from two burgers, two sodas and one french fries) in the trash can and head home.

• Purchase a large box of cereal and a variety pack that contains an equal weight of cereal. Remove (or eat!) the contents. Measure the area of the cardboard, foil and/or wax paper packaging. Which item (large box or variety pack) has more packaging per unit of cereal? Which costs more per unit of cereal? Why do you think it costs more? If you want more cereal for your money, which would you buy? If you want less packaging for the same amount of cereal, which would you buy? Why is cereal packaged in variety packs? Can any of the packaging be recycled?

• Talk with an older person in your community about what grocery shopping was like 50 years ago. Were the stores the same size or arranged inside like they are today (e.g., did shoppers take their own groceries from the shelf or did the clerk do it for them)? Where did the term "supermarket" come from? Why have there been changes in the way food is marketed? Were there as many items to choose from then? Why? How were the items wrapped?

• Write down what you had for lunch and list all the containers and packaging that came with the food. Discuss the items that could be reused or recycled.

• Interview grocery shoppers to find out why they buy certain products. What do they do with the packaging? How often do they consider packaging when they make a purchase?



How Times Have Changed

Goal: To have students investigate and think about how technologies, lifestyles and values change through time and how these changes alter the production and handling of wastes. To encourage students to develop a greater understanding of history and to express themselves through language.

Subjects: Social studies, language arts, science, art, environmental education.

Part 1 — What, No Video Games?

Grades: 5-12

Materials:
- tape recorder (optional)

Procedure:

1. Imagine yourself as a reporter investigating how times have changed since your parents and grandparents were children. To help you begin thinking about how things have changed, read either Section 1 or 2, or investigate the past by consulting books, the local historical society, old magazines, antique stores, museums, etc. As you do this, think about how you'd answer the questions that follow each section. Discuss your answers in class.

2. Interview your parents, grandparents or other adults to find out what they used in their everyday lives for toys, clothing, food wrappings, trashcans, etc., how these items have changed through time and how they feel about these changes. You can either design your own interview or read Section 1 or 2 to the person(s) you are interviewing, then ask the accompanying questions. (If you have a tape recorder, tape the conversation. Be sure to ask the person being interviewed if they mind being taped.)

3. Discuss your interview results in class.

Section 1: Sayings and Slogans

You've all heard sayings like:
"A stitch in time saves nine."
"Waste not, want not."
"An ounce of prevention is worth a pound of cure."
"Built to last a lifetime."

More recently, we hear slogans like:
"Quick and easy to use."
"No mess, no bother."
"Disposable."
"Individually wrapped for your convenience."
"They sure don't make 'em like they used to."

Questions:
- What other similar sayings and slogans can you think of?
- What are these slogans saying about our lifestyles and how they've changed?
- Which messages point out product quality? Which emphasize product convenience?
- Are products today built to be durable, convenient to use, or both? Why? What do you think about this?
- What qualities in products did people appreciate when you were growing up? Has that changed over time? How?
- Did people take better care of their belongings when you were growing up than they do now? Why? How many pants, dresses or pairs of shoes did you have? What were the clothes made of? When clothes tore or wore thin, were they repaired or were new ones purchased? What did you do with old clothes?
- Can you show me a family heirloom and describe the qualities that make it so special?
- Why are we attracted to items that are "new and improved?"
- Are we more wasteful today? In what ways? Why?
- What types of things did you throw out in the trash? Were they similar to what we throw out today? What containers did you use for trash? What did you do with trash? Did you have as much trash to throw away then as you do now?

Section 2: Toys for Us

Toys have changed through the years. At one time, most were made of natural objects. Then they were made of papier-mache, or were handmade country toys like whirligigs, bean shooters, yo-yos, limber jacks and tops. Over time, commercially manufactured toys became available, like wooden Lincoln Logs and Tinker Toys and metal Erector Sets. Then plastic toys came on the market — toy guns, frisbees, hula hoops and plastic models. Now, battery-operated and electronic toys, pinball games, video games and computers are popular.

Questions:
- What were your favorite toys when you were little? How many toys did you have?
- What were your toys made of? Who made them?
- How long did your toys last? Could they be fixed if they broke? Would it have been cheaper to fix the toy or get a new one? Why? Could you fix a broken toy at home or did someone else have to fix it?
- If broken toys could not be repaired, what did you do with them?
- How are toys sold today different from those you had?

Part 2 — The Garbage Guzzler Strikes Again

Grades: 4-7

Procedure:

1. Read the following unfinished story:

2. Write a final paragraph that describes what the Garbage Guzzler dumped in Jody's backyard. Read and discuss your concluding paragraphs in class.

3. Discuss possible answers to the questions that follow the story. Did your endings answer some of these questions?

4. For an art assignment, draw your image of the Garbage Guzzler.

Questions:

- From what dates in history did the Garbage Guzzler collect garbage?
- What items might Sam and Jody find in each garbage pile?
- What are these items made of?
- How many of the items do you think would be recyclable?
- Compare the items in the different piles. What do the differences indicate about the lifestyles of people at each location and each period in history? What might people from each period in history think about the garbage from other periods?
- What will happen to the items if they stay in Jody's backyard for a year, ten years, fifty years?
- What predictions do you have for what we will be throwing away in ten years, fifty years?
- What predictions do you have for the amount of trash we will throw away in ten or fifty years compared to how much we throw away now?
- Is there anything you can do to influence what trash will be like or how much trash there will be?

The Garbage Guzzler Strikes Again

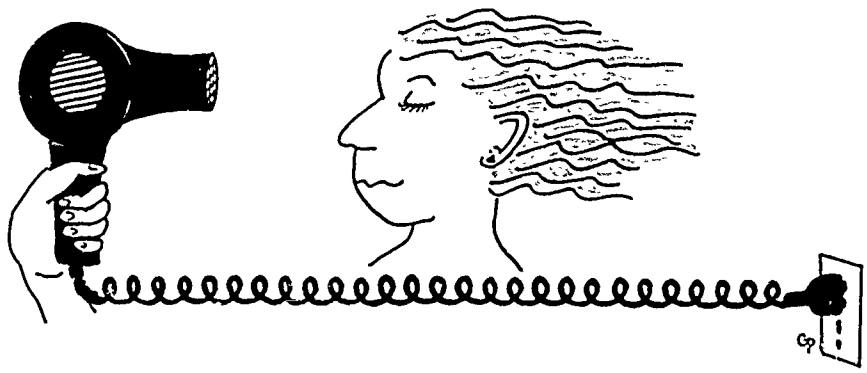
Sam and Jody's teacher has given their class an assignment to write about recycling and how the stuff Americans throw away has changed throughout history. Sam and Jody are having a tough time with the paper. Lucky for them, the Garbage Guzzler suddenly appears and offers to lend a hand!

The Guzz picks up the trashcan behind Jody's house and takes off in his Time Machine. Sam and Jody have no idea what the Guzz is up to. Are they surprised when he returns with a can of garbage he collected from a Pilgrim's house in Plymouth, Massachusetts! The Guzz makes three more trips in the Time Machine, returning with garbage collected from a Philadelphia house during the meeting of the first Continental Congress, from a miner's shack near Sutter's Mill during the California Gold Rush and from a Wisconsin house the day after Mount St. Helens erupted. He dumps all four cans of garbage in separate piles in Jody's backyard.

Sam and Jody are amazed by what they see in each pile. The Pilgrims had thrown out...

Going Beyond: Consider how other products we use in our homes have changed through time. Discuss:

- What did people do before there were products like Scotch tape, hairdryers, toilet bowl cleaner, soda cans, toothpaste tubes and pumps, plastic cups, power lawnmowers, disposable diapers, plastic wrap, vaccuum cleaners, plastic shampoo bottles, microwave ovens, etc.?
- What did they do with their leaves and garden clippings before there were plastic bags?
- How do changes in technology affect our living habits, our waste habits, our opportunities for recycling and our environment?

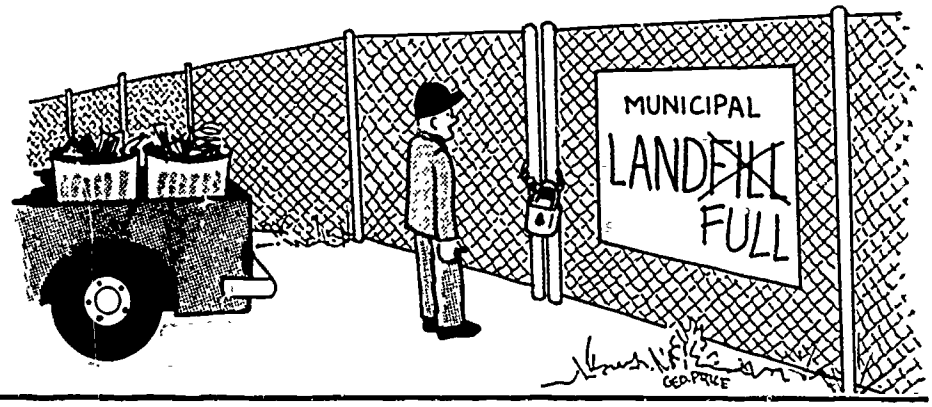


The Cost of the Toss

Goal: To have students develop a better understanding of what options exist for managing solid waste, and the costs and benefits of each option.

Subjects: Social studies, mathematics, environmental education, science, health.

Grades: 6-12.



Part 1 — Decisions, Decisions

Procedure:

1. Imagine yourself as the mayor of Wonderful, Wisconsin. Yours is a pleasant city of 65,000 people. Unfortunately, Wonderful is in the midst of a not-so-wonderful crisis: your landfill must be closed because it doesn't comply with present standards for protecting the environment. What's Wonderful going to do with all its garbage?

As mayor, you're responsible for investigating new options for managing Wonderful's solid waste. You begin by forming a solid waste committee to study the options. Who do you think should sit on this committee (town treasurer, public works director, citizen representative, landfill developer, etc.)? Assign fellow classmates to play these roles and decide on a name for your committee.

2. Call a meeting of the committee. Your assistant has prepared the chart, "Managing Garbage From Homes," to help members see some options and impacts of managing garbage from Wonderful's homes. Study the chart and, as a group, consider the following questions:

- At first glance, which waste disposal option seems best? Why? Do you all agree? Is there one best option?
- What criteria and values are you using to judge options? Are you pro-business, pro-taxpayer, pro-environment, pro-convenience? Discuss how your personal points of view might influence how you judge the importance of each potential impact.
- For how many years into the future are you planning? Why is this an important consideration (population growth, long-term economic and environmental impacts, etc.)?
- How big is 52,000 cubic yards? How much space will you need if you choose to landfill Wonderful's garbage for that many years?
- Compare the pros and cons of citizen convenience and environmental impacts for each option. Do you consider citizen convenience more important than environmental impacts or vice versa? Why? How does your view affect which option you think is better?
- What is the relationship between net cost and citizen convenience? Is what's convenient the least/most expensive? If saving money is your main concern, which option would you choose? Should saving money be your only concern?
- Does this chart calculate in the "costs" of each option's long-term environmental impacts or use of natural resources? What might these "costs" be? How much should your committee be concerned about these "costs" in making your decision? How easy is it to put a dollar value on environmental damage?
- If creating jobs is high on your list of priorities, which option would you choose? What do you think about the often-made statement that recycling eliminates jobs?
- You have read somewhere about composting municipal solid waste. Where can you find out more about composting? Why might your community consider composting as a valid option for waste disposal? Which wastes could be composted?
- What are the pros and cons of incineration? Do you think the benefits (landfill space saved, energy produced, convenient) outweigh the costs (landfill still necessary, toxic ash and air pollutants produced, expensive)? What are the experiences of other communities that already have installed incinerators? How do the pros and cons of incineration compare with those of recycling?
- Recycling newsprint sounds like a great way to save landfill space and trees. But you've heard that some newspapers use ink that contains lead, a hazardous metal. What happens to this lead when the paper is landfilled, recycled, composted, burned? What have newspaper manufacturers substituted for lead inks?

3. Investigate what is required by your local, state, and federal governments for chosing the waste management option(s) for Wonderful (e.g., public hearing, citizen referendum, DNR approval, environmental impact statement).

4. Do you feel you have enough information to make a wise descision for your town? If not, where can you find this information?

5. Now that your committee has investigated and discussed the options for Wonderful's solid waste management plan, make a decision about which option(s) the town should enact.

6. List suggestions for what you can do to ensure the success of Wonderful's new waste management plan (e.g., community education, providing containers for recycling).

Managing Garbage From Homes: Options & Impacts☆

Option	No. of employees	Landfill needs/yr. (cubic yards)	Net Cost ($/yr.) (includes sale of any energy produced)	Amount of Energy (gallons of gas equivalent)	Environmental Issues	Citizen Convenience
a) **Landfill** everything (landfill 15 mi. away)	Collection 40 Landfill 2 Total 42	52,000 yd³	Collection $1,300,000 Landfill 520,000 Total $1,820,000	Collection 30,000 gal. Landfill 13,000 Total Used 43,000 gal.	— is unattractive — uses land — can pollute water & air — can create hazardous gases (methane) — bury/lose natural resources	— just put waste at curb
b) **Voluntary Recycling** Curbside pickup of: glass, newsprint, plastic, aluminum. Landfill remainder.	Collection 44 Recycling center 8 Landfill 2 Total 54	47,000 yd³	Collection $1,400,000 Recycling 10,000 (profit) Landfill 470,000 Total $1,860,000	Collection 33,000 gal. Recycling (saves) 300,000 Landfill 12,000 Total Saved 255,000 gal.	— reduces impacts at landfill — reduces pollution from manufacturing — reuses natural resources	— need to separate recyclables — builds good habits
c) **Mandatory Recycling** (as in "b" above)	Collection 48 Recycling center 15 Landfill 2 Total 65	42,000 yd³	Collection $1,500,000 Recycling 60,000 (profit) Landfill 420,000 Total 1,860,000	Collection 36,000 gal. Recycling (saves) 600,000 Landfill 9,000 Total Saved 555,000 gal.	same as voluntary recycling above	— need to separate recyclables — requires enforcement for non-compliance — builds good habits
d) **Mandatory Composting** of yard waste. Landfill remainder. (#s assume ½ yard waste is composted at home)	Collection 42 Composting 1 Landfill 2 Total 45	45,000 yd³	Collection $1,350,000 Composting 50,000 Landfill 450,000 Total $1,850,000	Collection 33,000 gal. Composting 1,000 Landfill 10,000 Total Used 44,000 gal.	— reduces need for landfill — reduces methane gas pollution — reduces strength of leachate — produces fertile humus — reuses natural resources	— need to separate yard waste — builds good habits
e) **Incinerate** for energy recovery. Landfill ash & non-burnables. (incinerator in town)	Collection 38 Incinerator 12 Landfill 1 Total 51	10,000 yd³	Collection $1,250,000 Incineration 750,000 Landfill 200,000 Total $2,200,000	Collection 28,000 gal. Incinerator 840,000 (produces) Landfill 2,000 Total 810,000 gal. Produced	— reduces need for landfill — produces fly ash high in heavy metals that requires special handling — produces air pollutants — consumes natural resources	— just put waste at curb

☆Example compares costs for a community producing 100 tons/day, 5 days/week.
Numbers presented are realistic but not specific to any one community.
Other options and combinations of options exist.

Part 2 — Paying the True Price of Pop

Procedure:

1. Bring pop containers made of different materials to class to help you focus your inquiry on real objects. Discuss:
- What materials are your containers made of?
- How might this determine how you should dispose of them?
- What do you think are the best ways to manage the future of your containers? Why?
- How much of the cost of the pop do you think is packaging, how much is the cost of the pop itself?

2. Study the information in the chart, "The True Price of Pop." Discuss:
- How much of the cost of the pop is packaging?
- How do you feel about paying for the packaging?
- Who do you think should be responsible for its disposal?

3. List possible costs and benefits of disposing of your containers. Consider waste management impacts on economics, environment, energy use, jobs, etc. For example:
- Do the manufacturer and retailer of your containers pay for disposal, or is this cost passed on to you, the consumer? What do you think are their main concerns when they manufacture and sell your pop containers?
- What impacts might the disposal of your containers have on the environment? Who pays for the environmental impacts of waste disposal?
- If you are concerned about reducing solid waste in your town, then which container(s) would you buy?

The True Price of Pop (per 16 ounce serving)

Container	Cost to Consumer	Energy to make, transport, etc. (oz. of gas equivalent)	Solid Waste crushed (in^3)
Returnable glass bottle	21¢	1.4 oz.	1.4 in^3
Non-returnable glass bottle	35¢	6.3 oz.	5.8 in^3
Plastic bottle	40¢	3.1 oz.	7.0 in^3
Aluminum can	48¢	8.5 oz.	4.0 in^3

Going Beyond:
- Investigate how your town disposes of its solid waste. How much is landfilled? recycled? composted? incinerated? What plans does your town have for handling solid waste in the future? What do you think about these plans?
- Contact your trash collector to find out the total costs of collection, transportation and disposal per ton of solid waste. Discuss:
  - If your family produces two tons of trash each year (the average produced per family of five), then how much should your family pay for trash removal service?
  - How much does your family pay each year for trash service?
  - Do you think the cost for care of your solid waste is reasonable or unreasonable? Why?
  - Would you be willing to pay more to dispose of your trash? Why or why not?
  - How does the amount your family pays for trash service compare with the amount it pays for water or sewage services?
  - Would you be willing to recycle some household trash items if your town made it easy (e.g., curbside pickup of newspaper, glass, aluminum)?
- Investigate how society subsidizes some methods of handling waste. What do you think about such subsidies? For example:
  - Do your property taxes fully cover the cost of your local landfill?
  - Does government give tax breaks to people who grow trees to be used for making paper? Are similar tax breaks given to people who use recycled paper (instead of trees) to make new paper?
  - How many of your tax dollars are spent on educating citizens about recycling and composting?

Time For Action

Goal: To help students understand the process of taking environmental action. To have them identify a specific waste management problem in their community, design a research question addressing it, conduct the research and decide how and whether to take action to help solve the problem.

Subjects: Social studies, science, language arts, environmental education.

Grades: 7-12

Procedure:

1. What are several key solid waste management issues in your community? Find out about them by reading local newspapers, attending meetings of solid waste planning groups, talking to municipal or state solid waste managers, finding out the viewpoints of local environmental groups or reviewing local budgets for hauling and disposing of trash. For ideas and information, refer to the **Special Recycling Edition** (see Resources).

2. Select a local solid waste issue to investigate individually or as part of a small group. Focus on an issue that can be investigated within a reasonable amount of time. For example:
- What can be done if the local landfill is almost full?
- Is incinerating waste for energy an economically and environmentally sound management option?
- What steps could you take to reduce the amount of solid waste you make at home?
- How can people be informed about changing their buying and living habits to reduce how much they throw out?
- How much does the community spend handling trash compared to the budget for education, recreation, snow removal, police and fire protection or housing for the elderly?
- How do different fast food restaurants compare in what and how much waste they generate?
- How much methane gas is generated from solid waste? Is methane gas a problem? What are possible solutions?
- How much water falls on a landfill during the year? How much of this becomes runoff and leachate?
- What are the pollutants in leachate? What are the sources of these pollutants? Which are the most harmful?

3. Define your issue as precisely as possible, develop a research question(s) and conduct the research to answer your question. Possible research techniques for collecting data to help answer the question could include telephone interviews, development and use of surveys and questionnaires, and use of both primary and secondary references.

4. Prepare a research report to present in class. The report should include a description of: a) the issue; b) the research question; c) the method of investigation; d) the data gathered; e) how you analyzed the data; f) what conclusions you made from the study (both the knowledge gained and what value that knowledge has) and g) what concepts, values and beliefs influenced why you asked the question, why you selected the research method and how you interpreted the results.

5. Questions to consider as you investigate your issue and before you decide to take action include:
- Who is involved in the issue and what are their beliefs, values and attitudes?
- What are my beliefs and values about this issue?
- What specific types of action will I take? (persuasive, consumer, political, legal, direct, and/or personal action?)
- Is there sufficient evidence to warrant action on this issue?
- Are there alternative actions that I could take?
- Is the action I chose the most effective one available?
- What are the legal, social and economic consequences of this action?
- Do my personal values support this action?
- Do I understand the procedures necessary to take this action?
- Do I have the skills needed to take this action?
- Do I have the courage to take this action?
- Do I have the time needed to take this action?
- Do I have all of the other resources needed to make this action effective?
- What are the ecological consequences of this action?

(Questions from: **Investigating and Evaluating Environmental Issues and Actions: Skills Development Modules.** See Resources.)

6. If you decide to take action, choose strategies for which there is a likelihood of success within a realistic amount of time. For example:
- Survey litter production on your block, instead of surveying litter production in your entire town.
- Begin by writing letters to the editor of the local paper encouraging people to recycle, instead of aiming to convince the city council to start a mandatory recycling program. You might try to get editorial support for your viewpoint.
- Before you try to set up a community recycling center, see if your family is willing to recycle household wastes for a few months.

7. Add a conclusion to your report that describes the action you took and any results.

Going Beyond:
- Invite a member of your city's common council or county board to talk about how solid waste disposal and community recycling decisions are made. Consider giving your guest a list of questions you would like answered before he/she comes to your class.
- Attend a common council or county board meeting to observe local politics in action.

More Activity Ideas!

• Note what people in your neighborhood throw out on trash day. Do you see items that could be reused or recycled (e.g., window frames, old appliances, chicken wire, plastic plant trays, grass clippings, leaves, glass bottles, wood scraps)? Why do you think these items are being discarded instead of given away, recycled or reused? What might you do about this? (e.g., offer to take materials to or contact Goodwill, Salvation Army, recycling companies; hold a yardsale; find others who could use the materials.)

• Read the Dr. Suess story, **The Cat in the Hat Comes Back.** Discuss the concept of "away." Is there such a place? What do you think about The Cat in the Hat's solution to the problem?

• Investigate the United States' nationwide efforts to recycle during World War II. What was recycled? Why was recycling during the war so successful? How was recycling promoted and encouraged? Why is it harder to get people to recycle today?

• Collect and discuss examples of objects that can be reused in ways different from their original purpose.

• Visit a car "graveyard" to learn what parts of junked cars are reused or recycled. Note how changes in car design and materials have changed what's considered recyclable.

• Conduct a litter survey of your neighborhood or school grounds.

• Examine the pros and cons of using returnable beverage containers. What states have "bottle bills" (beverage container deposit laws)? Contact one or more of these states for information about how the legislation was accomplished politically, how it has been implemented and what impacts it has had on recycling, litter, jobs, public opinion, energy use, etc. Contact Wisconsin legislators, businesses, agencies and organizations and ask for their viewpoints and reasons for supporting or opposing beverage container deposit laws in Wisconsin. What do you think about a state or federal bottle bill?

• Collect photographs of life in other countries. Which countries do you think have the greatest solid waste problems? Why?

• Brainstorm ideas for how you can help reduce solid waste.

• Write slogans and make posters or mobiles about solid waste problems and solutions.

• Think about how you feel about solid waste — is it ugly or pretty? A problem or not?

• Ask everyone in your class to pick up a piece of litter on the way to school. What is litter? What items often end up as litter? Why? How much of what you collected could be recycled? How do you feel about litter? How do you feel about collecting it? Why do we have a litter problem? What is meant by the slogan, "Every litter bit hurts?" Is littering common in other countries? What is different about countries where littering is not common? What suggestions do you have for helping solve the litter problem? Are the suggestions realistic and something that you will do?

• Find out what the solid waste management laws are in your community. What are they designed to do? What do you think of them? Do they work well? If not, do you have suggestions for how they could be better?

• Consider the fact that the United States has 6% of the world's population, but uses 40-50% of the world's nonrenewable resources? What do you think about this?

• Conduct a survey of several fast-food restaurants and record the types of packaging (e.g., styrofoam, paper, aluminum foil) they use for similar items (e.g., soda, plain hamburger, fish sandwich, french fries, coffee). Note which containers/packages are made from renewable vs. nonrenewable resources. Is the packaging necessary or excessive? What criteria are you using to make your judgement? If you were concerned about the impacts of solid waste on the environment, which restaurant would you patronize? Could you influence the restaurant to change its packaging policies? How?

• Go to a fast-food restaurant and ask to be served a drink in your own cup or a hamburger on your own plate. Will/can the restaurant serve you? Why or why not? What do people think of you if you ask to be served in this way? What are the health requirements for packaging fast foods? Why were these rules made?

• Visit your local solid waste disposal service to learn how it disposes of your community's waste.

• Gather trash from school or home and design useful objects from it (musical instruments, toys, bird feeders, planters, doorstops, etc.) For ideas, write for the DNR's **Crafts from Trash** or **Ranger Rick: Recycling Reprints** (see Resources).

• Examine the contents of the classroom trash can at the end of the school day. Record each piece of trash as it's removed. Can you reconstruct the day's activities from the clues in the trash can? Are any of the items recyclable?

• Investigate why archaeologists and anthropologists are interested in old garbage dumps. What can studying the contents of old dumps tell us about earlier peoples? What is an Indian midden? What do you think people in the year 3000 would think about our culture if they were to do an archaeological dig in our landfills?

• Select and analyze an article about solid waste management from your local paper. What is the headline? Who, what and where is the story about? What are the conclusions? What do you think about the article? Does it present the facts you need to understand the issue? Does it interpret the facts well? Is it well written?

• Conduct a school or neighborhood yard sale to reuse unwanted objects. What do you think about the saying, "One person's trash is another's treasure?"

• Take a field trip to a nearby woods or old field. Look for evidence of nature's recycling processes. For example, find natural objects that are decomposing (dead plants and animals, animal droppings, feathers, fur, etc.) and what "decomposers" are assisting this process (fungi, insects, molds, etc.). Investigate what you find carefully, and discuss what you see, smell and feel. Why is decomposition such an important natural process?

• Visit a paper manufacturing plant. Does the plant use only virgin materials or does it also manufacture recycled paper? What are the pros and cons of manufacturing paper from virgin materials vs. recycled materials?

• Investigate the Wisconsin tax advantages/disadvantages of using virgin materials vs. recycled materials to make paper. What do you think about these tax laws?

• Investigate how newsprint in your community is recycled. Do many people recycle their newspaper? Why or why not?

• Consider why we've shifted from glass milk bottles delivered to the door to plastic or plastic-coated paper containers purchased at the store? What are the economic, environmental and social impacts of this shift?

• Place 20 objects, both natural and human-made, on the floor. Name the objects and decide if they are natural or human-made and why. How completely do natural objects decompose compared to human-made ones? Which objects are more likely to release harmful chemicals to the environment as they decompose?

• Find out about ways in which litter harms animals. Investigate the possible impacts of: discarded fishing line and plastic six-pack holders on waterbirds (they can get tangled); old soda or beer bottles on shrews and other small mammals (they enter a tilted, slippery bottle and can't get back out); flip-tops on fish (small fish can get stuck in the rings); and cigarette butts, tin cans and other litter on deer, raccoons and other mammals (they eat the litter or can cut their tongues on sharp edges). Humans also can be hurt. Have you ever cut your foot on broken glass or a discarded nail? Think of other ways that litter can harm people and other animals. How can such problems be prevented? Contact your state legislator for an update on Wisconsin laws that address these problems.

• Contact a glass manufacturing company and ask for an estimate of the amount of energy required to produce, recycle and reuse a ton of glass bottles. What other costs should be considered when choosing which strategy for handling glass is best (e.g., costs of collection and transportation)? What do you think your family should do with its glass? How much energy would your actions use/save? Should we recycle bottles to save energy? Why? What impacts might this have on jobs, the environment, trash removal costs, etc.?

• Set up a recycling plan for your school. Determine what can be recycled, find sources for the sale of recyclable materials, establish a procedure for recycling, elicit support from school organizations (e.g., service clubs could help coordinate the plan, shop class could make or design recycling bins), discuss your plan with school administrators and present your proposal to the school board. Enact your recycling plan.

• Investigate what happens to old tires. What are the problems associated with tire disposal? Research the causes and effects of the tire fire that began in Somerset, Wisconsin, on October 18, 1986. What sources of information can you consult to find out about the fire?

Resources

General References

Bibliography of Public Information Publications on Recycling and Resource Recovery. Bur. of Solid Waste Manage., Wis. DNR. Order from: Bur. of Info. and Educ.

Community Recycling Activities. 1985. Bur. of Solid Waste Manage., Wis. DNR. Order from: Bur. of Info. and Educ.

Earth Day Report. March-April 1985. *Wisconsin Natural Resources.* Vol. 9, No. 2. Bur. of Info. and Educ., Wis. DNR.

The Everyman's Guide to Ecological Living. 1971. Greg Cailliet, et al. Macmillan Publ. Co., 866 3rd Ave., New York, NY 10022.

Foxfire Books, Vols. 1-8. Eliot Wigginton. Doubleday and Co., Inc., 245 Park Ave., New York, NY 10017.

How to Grow Vegetables and Fruits by the Organic Method. 1975. J.I. Rodale. Rodale Press, Emmaus, PA 18049.

Investigating and Evaluating Environmental Issues and Actions: Skills Development Modules. 1985. H. Hungerford, et al. Stipes Publ. Co., P.O. Box 526, 10-12 Chester St., Champaign, IL 61820.

Limits to Growth. 1972. Donella and Dennis Meadows, et al. Universe Books, 381 Park Ave. S., New York, NY 10016.

Markets for Wisconsin's Recycled Materials. 1986. Bur. of Solid Waste Manage., Wis. DNR. Order from: Bur. of Info. and Educ.

Recycling. Rodale Press, Emmaus, PA 18049.

Special Recycling Edition. July-August 1985. *Wisconsin Natural Resources.* Vol. 8, No. 4. Bur. of Info. and Educ., Wis. DNR.

Throwing Things Away: From Middens to Resource Recovery. 1986. Laurence Pringle. Thomas Y. Crowell, 10 E. 53rd St., New York, NY 10022.

Wisconsin's Community Recycling Collection Programs Directory. 1985. Bur. of Solid Waste Manage., Wis. DNR. Order from: Bur. of Info. and Educ.

Composting and Decomposition References

The Complete Book of Composting. 1969. J.I. Rodale, ed. Rodale Press, Emmaus, PA 18049.

Composting: A Study of the Process and It's Principles. 1972. Clarence G. Golveke. Rodale Press, Emmaus, PA 18049.

Earthworms, Dirt and Rotten Leaves: An Exploration in Ecology. 1986. Molly McLaughlin. Macmillan Publ. Co., 866 3rd Ave., New York, NY 10022.

Ecology of Compost: A Public Involvement Project. 1976. Daniel L. Dindal. Office of Public Service, State Univ. of New York, Syracuse, NY 13210.

Everyone's Guide to Home Composting. 1978. Robyn Bem. Van Nostrand Reinhold Co., 135 W. 50th St., New York, NY 10020.

Grass Clippings: Good As Gold For Your Lawn. 1987. Bur. of Solid Waste Manage., Wis. DNR. Order from: Bur. of Info. and Educ.

Home Composting: Reap a Heap of Benefits. 1987. Bur. of Solid Waste Manage., Wis. DNR. Order from: Bur. of Info. and Educ.

Living Earth. 1959. Peter Farb. Harper & Row Publ., Inc., 10 E. 53rd St., New York, NY 10022.

The Natural History Guide. 1967. H. Charles Laun. Alsace Books and Films, 1212 Hazel Dr., Alton, IL 62002.

Research Report on a Composting Greenhouse. 1987. Bruce Fulford. The New Alchemy Inst., 237 Hatchville Rd., E. Falmouth, MA 02536.

Soil Animals. 1968. Friedrich Schaller. The Univ. of Michigan Press, P.O. Box 1104, Ann Arbor, MI 48106.

Trees Are Terrific. 1985. *NatureScope,* National Wildlife Federation, 1412 16th St. NW, Washington, DC 20036.

The Wild World of Compost. August 1980. Cecil E. Johnson. In: *National Geographic,* 157:273-284. National Geographic Society, 17th and M Sts. NW, Washington, DC 20036.

Wisconsin's Composting Communities. 1987. Bur. of Solid Waste Manage., Wis. DNR. Order from: Bur. of Info. and Educ.

Curriculum Materials

A Guide to Curriculum Planning in Environmental Education. 1985. David C. Engleson. Dept. of Public Instruction, P.O. Box 7841, Madison, WI 53707-7841.

A-Way With Waste: A Waste Management Curriculum for Schools (K-12). 1984. Washington State Dept. of Ecology, Litter Control and Recycling Program, 4350 150th Ave. NE, Redmond, WA 98052.

CLASS Project: Conservation Learning Activities for Science and Social Studies. National Wildlife Federation, 1412 16th St. NW, Washington, DC 20036; Dept. of Public Instruction, P.O. Box 7841, Madison, WI 53707.

Crafts from Trash. 1984. Bur. of Solid Waste Manage., Wis. DNR. Order from: Bur. Info. and Educ.

Groundwater Study Guide. 1984. Bur. of Info. and Educ., Wis. DNR.

Here Today, Here Tomorrow: A Curriculum on Recycling, Energy and Solid Waste (K-12). 1982. Conserv. and Environ. Studies Center, Inc., 120-13 Whitesbog Rd., Browns Mills, NJ 08015; NJ Dept. of Energy, Office of Recycling, 101 Commerce St., Newark, NJ 07102.

The Importance of Being a Garbologist (4-6). 1976. GRIP, P.O. Box 7391, Pittsburgh, PA 15213.

Let's Recycle!: Lesson Plans for Grades K-6 and 7-12. 1980. U.S. Govt. Printing Office, Supt. of Documents, Washington, DC 20402. EPA Publ. No. SW 801.

Let's Recycle: Lesson Suggestions for Teachers of K-3. 1977. Recycling Council of British Columbia, 1629 Columbia St., Vancouver, B.C., Canada.

Operation Waste Watch: Seven Sequential Learning Units. 1980. Virginia Div. of Litter Control, 1116 Washington Bldg., Richmond, VA 23219.

Put Your Garbage to Work (7-12). 1979. GRIP, P.O. Box 7391, Pittsburgh, PA 15213.

Ranger Rick: Recycling Reprints. National Wildlife Federation, 1412 16th St. NW, Washington, DC 20036.

Recycle Alaska: Activities Handbook. 1982. Dept. of Environ. Conserv., Pouch O, Juneau, AK 99811.

Recycle for Reuse: 4-H Leader-Member-Family Guide. 1985. 4-H Programs, Univ. of Wis.-Extension, Madison, WI 53706. Publ. No. 362.

Recycling: Activities for the Classroom. 1978. Mary Lynne Bowman, Herbert L. Coon. ERIC/SMEAC Center, 1200 Chambers Rd., 3rd Floor, Ohio State Univ., Columbus, OH 43212.

Recyclopedia: Games, Science Equipment and Crafts from Recycled Materials. 1976. Robin Simons. Houghton Mifflin Co., 2 Park St., Boston, MA 02107.

Recyculum (K-6). 1980. Eco-Alliance, P.O. Box 101, Corvallis, OR 97330.

Reduction, Reuse, Recycling (K-12). Assoc. of Oregon Recyclers, 1615 NW 23rd Ave., Suite 1, Portland, OR 97210.

Teacher's Guide: Educational Materials in Resource Recovery (K-12). 1984. Cathy A. Berg. ERIC/SMEAC, 1200 Chambers Rd., 3rd Floor, Columbus, OH 43212. ED 258 835.

Teaching Science With Garbage: An Interdisciplinary Approach to Environmental Education from the Point of View of Science, Mathematics and Social Studies. 1971. Albert & Vivian Schatz. Rodale Press, Emmaus, PA 18049.

The Trash Monster. 1980. Calif. State Solid Waste Manage. Board, 1020 9th St., Suite 300, Sacramento, CA 95814.

Waste: An Instructional Module for the Tenth Grade. 1980. M-STS, P.O. Box 1603, Wausau, WI 54401.

The Wizard of Waste. 1980. Calif. State Solid Waste Manage. Board, 1020 9th St., Suite 300, Sacramento, CA 95814.

Audio-Visual Materials

Audio-Visual Aids on Recycling: Resource List. 1985. Bur. of Solid Waste Manage., Wis. DNR. Order from: Bur. of Info. and Educ.

Dodge County Says Please Recycle. 15 min. slide-tape. Dodge Co. Library Service, 311 N. Spring St., Juneau, WI 53039.

Energy Where You Least Expect It. 28 min. film. Third Eye Films, 12 Arrow St., Cambridge, MA 02138.

The Trash Monster. 12 min. filmstrip. Calif. Solid Waste Manage. Board, 1020 9th St., Suite 300, Sacramento, CA 95814.

The Wizard of Waste. 12 min. filmstrip. Calif. Solid Waste Manage. Board, 1020 9th St., Suite 300, Sacramento, CA 95814.

Agencies and Organizations

Wisconsin

Citizens for a Better Environment, 150 W. Juneau Ave., Suite 206, Milwaukee, WI 53202; 111 King St., Madison, WI 53703; 1270 Main St., Green Bay, WI 54302.

League of Women Voters, Wisconsin Chapter, 121 S. Hancock St., Madison, WI 53703-3447.

Sierra Club, John Muir Chapter, 111 King St., Madison, WI 53703.

Waste Facility Siting Board, 132 E. Wilson St., Madison, WI 53702.

Wisconsin Counties Solid Waste Management Association, 802 W. Broadway, Suite 308, Madison, WI 53713.

Wisconsin Department of Natural Resources, P.O. Box 7921, Madison, WI 53707. (Environ. Educ. Specialist, Bur. of Info. and Educ., 608-266-6790; Recycling Coordinator, Bur. of Solid Waste Manage., 608-267-7565)

Wisconsin Department of Public Instruction, Environ. Educ. Supervisor, P.O. Box 7841, Madison, WI 53707-7841.

Wisconsin Recycles, P.O. Box 2842, Oshkosh, WI 54903.

Wisconsin's Environmental Decade, 14 W. Mifflin St., Madison, WI 53703; 230 W. Wells St., Suite 309, Milwaukee, WI 53203; 214½ E. College Ave., Appleton, WI 54911.

University of Wisconsin-Extension, Community Dynamics Institute, Lowell Hall, 610 Langdon St., Madison, WI 53706; also, contact your County Extension office.

United States

The Aluminum Association, 818 Connecticut Ave. NW, Washington, DC 20006.

American Paper Institute, 260 Madison Ave., New York, NY 10016.

Environmental Defense Fund, 1616 P St. NW, Washington, DC 20036.

Environmental Task Force, 1346 Connecticut Ave. NW, Suite 912, Washington, DC 20036.

Glass Packaging Institute, 1133 20th St. NW, Rm. 321, Washington, DC 20036.

Institute of Scrap Recycling Industries, 1627 K St. NW, Washington, DC 20006.

Izaak Walton League of America, Inc., 1701 N. Fort Myers Dr., Suite 1100, Arlington, VA 22209.

Keep America Beautiful, 99 Park Ave., New York, NY 10016.

National Audubon Society, 950 3rd Ave., New York, NY 10022.

National Recycling Coalition, 29-28 41st Ave., 5th Floor, Long Island City, NY 11101.

National Solid Waste Management Association, 1120 Connecticut Ave. NW, Washington, DC 20005.

National Wildlife Federation, 1412 16th St. NW, Washington, DC 20036.

The New Alchemy Institute, 237 Hatchville R., E. Falmouth, MA 02536.

Resources for the Future, 1616 P St. NW, Washington, DC 20036.

The Society of the Plastic Industry, 1275 K St., Suite 400, Washington, DC 20005.

U.S. Environmental Protection Agency, 401 M St. SW, Washington, DC 20460 (Office of Solid Waste Manage. and Emergency Response; Office of Public Awareness; Office of Pesticides and Toxic Substances); Region V, Office of Public Affairs, 230 S. Dearborn St., Chicago, IL 60604.

The purpose of Department of Natural Resources study guides is to help increase Wisconsin citizens' knowledge about and understanding of our state's environment. We hope to provide information about important environmental issues, encourage respect for the environment and help citizens become active stewards of our natural resources.

Credits and Acknowledgements

Authors: Anne Hallowell, Carrie Morgan, John Reindl, Dan Sivek, Larry Sperling, Dennis Yockers
Editor and Project Coordinator: Anne Hallowell
Special thanks for editorial advice: Wendy McCown, Karen Fiedler, Joel Stone, Bob Wallen
Graphic Designer/Illustrator: Georgine Price
Typesetter: Kathy MacDonald

Production of this study guide was partially funded by individual contributions from Wisconsin educators. If you would like to make a donation, please make your check payable to: Education Programs, Dept. of Natural Resources, and mail to the address below. Thank you.

Your comments and suggestions about this study guide are welcome. Address your comments to:

Education Programs
Bureau of Information and Education
Wis. Dept. of Natural Resources
P.O. Box 7921
Madison, WI 53707

For further information about recycling in Wisconsin, contact:

Recycling Coordinator
Bureau of Solid Waste Management
Wis. Dept. of Natural Resources
P.O. Box 7921
Madison, WI 53707
(608) 267-7565

Printed on Recycled Paper.